

787

Quick Reference Handbook

Quick Action Index

Aborted Engine Start L, R	7.1
AIRSPEED UNRELIABLE	10.1
CABIN ALTITUDE.....	2.1
Dual Eng Fail/Stall	7.2
Dual Eng Fail/Stall	7.3
ENG AUTOSTART L, R.....	7.3
ENG LIMIT EXCEED L, R	7.4
ENG SURGE L, R.....	7.7
Eng Svr Damage/Sep L, R.....	7.8
Evacuation	Back Cover.2
FD DOOR AUTO UNLOCK	1.1
FIRE APU	8.1
FIRE ENG L, R	8.2
Fire Eng Tailpipe L, R.....	8.5
Loss of All Displays.....	10.8
Smoke, Fire or Fumes	8.6
STABILIZER.....	9.1

Intentionally
Blank

Non-Normal Checklists**Chapter EICAS****EICAS Messages****Section Index****A**

A/P BACKDRIVE COLUMN	4.2
A/P BACKDRIVE PEDAL	4.2
A/P BACKDRIVE WHEEL	4.3
AHRU ATT MODE L, R	11.1
AIRSPPEED LOW	15.1
AIRSPPEED UNRELIABLE	10.1
ALTITUDE ALERT	15.1
ALTITUDE CALLOUTS	15.1
ALTN ATTITUDE CAPT, F/O	10.13
ANTI-ICE DET WING	3.1
ANTI-ICE ENG L, R.....	3.1
ANTI-ICE LEAK ENG L, R.....	3.2
ANTI-ICE LOSS ENG L, R	3.5
ANTI-ICE ON.....	3.5
ANTI-ICE PACKS.....	3.6
ANTI-ICE WING.....	3.6
ANTISKID	14.1
APU LIMIT	7.10
APU SHUTDOWN	7.10
AURAL CANCELED	15.1
AUTO SPEEDBRAKE	9.3
AUTOBRAKE	14.1
AUTOPILOT	4.1
AUTOPILOT DISC	4.1
AUTOTHROTTLE DISC	4.1

AUTOTHROTTLE L, R..... 4.1

B

BARO SET DISAGREE 10.13

BOTTLE 1, 2 DISCH ENG8.10

BOTTLE DISCH APU8.10

BOTTLE DISCH CARGO8.11

BRAKE TEMP.....14.2

BRAKES14.2

C

CABIN ALTITUDE AUTO 2.2

CABIN ALTITUDE..... 2.1

CABIN TEMPERATURE 2.4

CARGO A/C FWD 2.6

CARGO HEAT BULK, FWD 2.6

CHKL INCOMPLETE NORM..... 10.13

CHKL NON-NORMAL..... 10.14

CONFIG DOORS15.1

CONFIG FLAPS15.2

CONFIG GEAR15.2

CONFIG PARKING BRAKE15.2

CONFIG RUDDER15.2

CONFIG SPOILERS15.2

CONFIG STABILIZER15.3

CONFIG WARNING SYS15.3

CREW OXYGEN LOW 1.1

CRUISE FLAPS SYS..... 9.4

D

DATALINK LOST	5.1
DATALINK SYS	5.1
DET FIRE APU	8.11
DET FIRE CARGO AFT, FWD	8.11
DET FIRE ENG L, R	8.12
DOOR AFT, FWD CARGO	1.2
DOOR AFT, FWD E/E ACCESS	1.4
DOOR BULK CARGO	1.4
DOOR ENTRY 1-4L, R	1.4
DOOR FD OVHD	1.5
DOOR FWD ACCESS	1.5
DOORS	1.5

E

EFIS/DSP PANEL L, R	10.14
ELEC AC BUS L1	6.1
ELEC AC BUS L2	6.2
ELEC AC BUS R1	6.4
ELEC AC BUS R2	6.6
ELEC BATTERY OFF	6.7
ELEC CABIN/UTIL OFF	6.7
ELEC GEN DRIVE L1, L2, R1, R2	6.8
ELEC GEN OFF APU L, R	6.8
ELEC GEN OFF L1, L2, R1, R2	6.9
ELEC IFE/SEATS OFF	6.9
ELEC STANDBY SYS	6.9
ELT ON	1.5

EMER LIGHTS	1.6
ENG AUTOSTART L, R	7.3
ENG CONTROL L, R	7.11
ENG CORE ANTI-ICE L, R.....	7.11
ENG EEC MODE L, R	7.12
ENG FAIL L, R.....	7.13
ENG FUEL FILTER L, R.....	7.17
ENG FUEL NOZZLE L, R	7.18
ENG FUEL VALVE L, R	7.18
ENG FUEL VALVE L, R	7.19
ENG LIMIT EXCEED L, R	7.4
ENG LIMIT PROT L, R.....	7.23
ENG OIL FILTER L, R.....	7.24
ENG OIL PRESS L, R	7.28
ENG OIL TEMP L, R.....	7.32
ENG OIL TEMP L, R.....	7.35
ENG REV AIR/GND	7.37
ENG REV COMMANDED L, R	7.37
ENG REV LIMITED L, R.....	7.38
ENG REVERSER L, R	7.38
ENG RPM LIMITED L, R	7.38
ENG SEC AIR VLV L, R	7.39
ENG SHUTDOWN	7.39
ENG SHUTDOWN L, R	7.39
ENG START CUTOUT L, R.....	7.40
ENG STARTERS L, R	7.40
ENG SURGE L, R	7.7
ENG TBV OPEN L, R	7.41

ENG THRUST HIGH L, R	7.42
ENG THRUST L, R	7.41
EQUIP CLG OVRD AFT	2.6
EQUIP CLG OVRD FWD.....	2.7
EQUIP COOLING AFT	2.7
EQUIP COOLING FWD	2.8
EQUIP OVBD VLV AFT	2.8
EQUIP OVRD VLV AFT, FWD	2.9
EVAC COMMAND	1.6

F

FD DOOR AUTO UNLOCK	1.1
FD DOOR LOCK FAIL.....	1.6
FD DOOR OPEN	1.6
FIRE APU	8.1
FIRE CARGO AFT.....	8.14
FIRE CARGO FWD	8.16
FIRE ENG L, R	8.2
FIRE WHEEL WELL.....	8.18
FLAP/SLAT CONTROL	9.10
FLAPS DRIVE	9.6
FLAPS PRIMARY FAIL	9.8
FLIGHT CONTROL MODE	9.12
FLIGHT CONTROLS.....	9.16
FLT CONTROLS LOCKED	9.17
FMC HOLD AIRSPACE.....	11.3
FMC INTERCEPT HDG	11.4
FMC MESSAGE	11.4

FMC PERF UNAVAIL	11.4
FMC RUNWAY DISAGREE	11.4
FMC UNABLE RTA	11.5
FMC VERIFY POSITION	11.5
FMC.....	11.2
FUEL AUTO JETTISON	12.1
FUEL BALANCE SYS	12.4
FUEL CROSSFEED.....	12.6
FUEL DISAGREE	12.7
FUEL IMBALANCE	12.8
FUEL IN CENTER	12.9
FUEL JETT NOZZLE L, R	12.9
FUEL JETTISON MAIN	12.11
FUEL JETTISON SYS	12.12
FUEL LOW CENTER	12.17
FUEL PRESS ENG L+R	12.19
FUEL PRESS ENG L, R	12.18
FUEL PUMP CENTER L, R	12.20
FUEL PUMP CTR L+R.....	12.21
FUEL PUMP L AFT, FWD	12.21
FUEL PUMP R AFT, FWD	12.21
FUEL QTY LOW.....	12.22
FUEL TEMP HIGH.....	12.25
FUEL TEMP LOW.....	12.26
FUEL VALVE APU	12.26

G

GEAR DISAGREE	14.3
---------------------	------

GEAR DOOR	14.6
GEAR DRAG BRACE L, R.....	14.6
GEAR SIDE BRACE L, R.....	14.8
GND PROX SYS	15.3
GPS	11.5
GPWS FLAP OVRD	15.3
GPWS GEAR OVRD	15.4
GPWS TERR OVRD	15.4

H

HEAT PITOT C.....	3.6
HEAT PITOT L.....	3.6
HEAT PITOT L+C+R.....	3.7
HEAT PITOT R.....	3.7
HF DATALINK	5.1
HUD SNGL OPERATION	10.15
HUD SYS CAPT, F/O	10.15
HUD TAKEOFF	10.15
HYD OVERHEAT C1.....	13.1
HYD OVERHEAT C2.....	13.1
HYD OVERHEAT DEM L, R.....	13.1
HYD OVERHEAT PRI L, R	13.2
HYD PRESS C1.....	13.2
HYD PRESS C2.....	13.3
HYD PRESS DEM L, R.....	13.3
HYD PRESS PRI L, R	13.4
HYD PRESS SYS C	13.5
HYD PRESS SYS L	13.8

HYD PRESS SYS L+C	13.9
HYD PRESS SYS L+C+R	13.13
HYD PRESS SYS L+R	13.14
HYD PRESS SYS R	13.17
HYD PRESS SYS R+C	13.18
HYD QTY LOW C, L, R	13.21

I

ICE DETECTORS	3.7
ICING ENG	3.7
INSUFFICIENT FUEL	11.6
IRU ATT MODE L, R	11.7
IRU/AHRU MOTION	11.7

L

LANDING ALTITUDE	2.9
LIQUID CLG QTY L, R	2.9
LIQUID COOLING L	2.10
LIQUID COOLING R	2.11
LNAV BANK ANGLE LIM	11.7

M

MAIN BATTERY DISCH	6.10
MAIN BATTERY LOW	6.10

N

NAV AIR DATA SYS	11.8
NAV AIRSPEED DATA	11.12
NAV APPROACH GLS	11.15
NAV APPROACH ILS	11.16

NAV INERTIAL SYS	11.17
NAV IRU	11.21
NAV SINGLE GPS	11.22
NAV UNABLE RNP	11.22
NO AUTOLAND	4.3
NO AUTOLAND GLS	4.3
NO AUTOLAND ILS	4.3
NO LAND 3	4.4
NOSE WHEEL STEERING	14.10

O

OUTFLOW VALVE AFT, FWD	2.12
OVERHEAT ENG L, R	8.20
OVERHEAT WHEEL WELL	8.23
OVERHEAT WING	3.8
OVERSPEED	15.4

P

PACK ALTITUDE LIMIT	2.12
PACK L+R	2.14
PACK L, R	2.13
PACK MODE L, R	2.16
PASS OXYGEN ON	1.7
PILOT RESPONSE	15.4
PITCH DOWN AUTHORITY	9.19
PITCH UP AUTHORITY	9.20
PRI FLIGHT COMPUTERS	9.22

R

RADIO TRANSMIT CAPT, F/O, OBS	5.1
-------------------------------------	-----

RAT UNLOCKED	13.21
RECIRC FAN LWR, UPR OFF	2.16
ROLL LEFT AUTHORITY	9.26
ROLL RIGHT AUTHORITY	9.28
ROLL/YAW ASYMMETRY.....	9.29
RWY/APP CRS ERROR	11.23
RWY/APP TUNE ERROR.....	11.23

S

SATCOM	5.2
SATCOM DATALINK	5.2
SATVOICE LOST	5.2
SGL SOURCE APPROACH	11.24
SGL SOURCE ATTITUDE	10.16
SGL SOURCE RAD ALT	10.16
SINGLE FMC	11.23
SINGLE SOURCE FD	11.24
SLATS DRIVE.....	9.30
SLATS PRIMARY FAIL.....	9.31
SMOKE EQUIP CLG AFT	8.24
SMOKE EQUIP CLG FWD.....	8.26
SMOKE EQUIP CLG MISC.....	8.28
SMOKE LAVATORY	8.31
SMOKE REST UPR DR 1	8.32
SMOKE REST UPR DR 4.....	8.33
SPEEDBRAKE EXTENDED	9.31
SPOILER DRAG	9.32
SPOILER PAIRS.....	9.32

SPOILERS	9.33
STAB GREENBAND	9.34
STABILIZER	9.1
STABILIZER CUTOUT	9.35
STABILIZER L2	9.35
STABILIZER R2	9.35
STALL PROTECTION	9.36

T

T/O THRUST DISAGREE	4.4
TAIL STRIKE	15.5
TCAS	15.5
TCAS OFF	15.5
TCAS RA CAPTAIN, F/O	15.6
TCP ALTN NAV	11.24
TERR POS	15.6
THRUST ASYM PROT	7.42
TILLER L, R	14.10
TIRE PRESS	14.10
TRANSPONDER	11.24
TRANSPONDER PANEL	11.25
TRIM AIR L, R	2.16

V

VENTILATION ALTN	2.17
VHF DATALINK	5.2

W

WEATHER RADAR SYS	11.25
WINDOW HEAT	3.11

WINDOW HEAT L, R FWD	3.12
WINDOW HEAT L, R SIDE.....	3.13
WINDSHEAR SYS	15.6
WING ANTI-ICE OFF.....	3.13

Non-Normal Checklists

Chapter Unann

Unannunciated Checklists

Section Index

Aborted Engine Start L, R.....	7.1
Ditching	0.1
Dual Eng Fail/Stall	7.2
Dual Eng Fail/Stall	7.3
Eng In-Flight Start L, R	7.20
Eng In-Flight Start L, R	7.22
Eng Svr Damage/Sep L, R	7.8
Evacuation	Back Cover.2
Fire Eng Tailpipe L, R	8.5
Fuel Jettison	12.10
Fuel Leak	12.13
Gear Lever Locked Down.....	14.8
Jammed Flight Controls.....	9.18
Loss of All Displays	10.8
Overweight Landing.....	0.6
Smoke or Fumes Removal	8.30
Smoke, Fire or Fumes	8.6
TAT Probe Icing	3.8
Volcanic Ash	7.43
Volcanic Ash	7.46
Window Damage Fwd L, R	1.8
Window Damage Side L, R.....	1.9

Intentionally
Blank

Non-Normal Checklists**Chapter Alpha****Alphabetical****Section Index****A**

A/P BACKDRIVE COLUMN	4.2
A/P BACKDRIVE PEDAL	4.2
A/P BACKDRIVE WHEEL	4.3
Aborted Engine Start L, R.....	7.1
AHRU ATT MODE L, R	11.1
AIRSPEED LOW	15.1
AIRSPEED UNRELIABLE	10.1
ALTITUDE ALERT	15.1
ALTITUDE CALLOUTS	15.1
ALTN ATTITUDE CAPT, F/O	10.13
ANTI-ICE DET WING	3.1
ANTI-ICE ENG L, R.....	3.1
ANTI-ICE LEAK ENG L, R.....	3.2
ANTI-ICE LOSS ENG L, R	3.5
ANTI-ICE ON.....	3.5
ANTI-ICE PACKS.....	3.6
ANTI-ICE WING.....	3.6
ANTISKID	14.1
APU LIMIT.....	7.10
APU SHUTDOWN	7.10
AURAL CANCELED	15.1
AUTO SPEEDBRAKE	9.3
AUTOBRAKE	14.1
AUTOPILOT	4.1
AUTOPILOT DISC	4.1

AUTOTHROTTLE DISC	4.1
AUTOTHROTTLE L, R.....	4.1

B

BARO SET DISAGREE	10.13
BOTTLE 1, 2 DISCH ENG	8.10
BOTTLE DISCH APU	8.10
BOTTLE DISCH CARGO	8.11
BRAKE TEMP.....	14.2
BRAKES	14.2

C

CABIN ALTITUDE AUTO	2.2
---------------------------	-----

CABIN ALTITUDE..... 2.1

CABIN TEMPERATURE	2.4
CARGO A/C FWD	2.6
CARGO HEAT BULK, FWD	2.6
CHKL INCOMPLETE NORM.....	10.13
CHKL NON-NORMAL.....	10.14
CONFIG DOORS	15.1
CONFIG FLAPS	15.2
CONFIG GEAR	15.2
CONFIG PARKING BRAKE	15.2
CONFIG RUDDER	15.2
CONFIG SPOILERS	15.2
CONFIG STABILIZER	15.3
CONFIG WARNING SYS	15.3
CREW OXYGEN LOW	1.1
CRUISE FLAPS SYS.....	9.4

D

DATALINK LOST	5.1
DATALINK SYS	5.1
DET FIRE APU	8.11
DET FIRE CARGO AFT, FWD	8.11
DET FIRE ENG L, R	8.12
Ditching	0.1
DOOR AFT, FWD CARGO	1.2
DOOR AFT, FWD E/E ACCESS	1.4
DOOR BULK CARGO	1.4
DOOR ENTRY 1-4L, R	1.4
DOOR FD OVHD	1.5
DOOR FWD ACCESS	1.5
DOORS	1.5
Dual Eng Fail/Stall	7.2
Dual Eng Fail/Stall	7.3

E

EFIS/DSP PANEL L, R	10.14
ELEC AC BUS L1	6.1
ELEC AC BUS L2	6.2
ELEC AC BUS R1	6.4
ELEC AC BUS R2	6.6
ELEC BATTERY OFF	6.7
ELEC CABIN/UTIL OFF	6.7
ELEC GEN DRIVE L1, L2, R1, R2	6.8
ELEC GEN OFF APU L, R	6.8
ELEC GEN OFF L1, L2, R1, R2	6.9

ELEC IFE/SEATS OFF	6.9
ELEC STANDBY SYS	6.9
ELT ON	1.5
EMER LIGHTS	1.6
ENG AUTOSTART L, R	7.3
ENG CONTROL L, R	7.11
ENG CORE ANTI-ICE L, R.....	7.11
ENG EEC MODE L, R	7.12
ENG FAIL L, R.....	7.13
ENG FUEL FILTER L, R.....	7.17
ENG FUEL NOZZLE L, R	7.18
ENG FUEL VALVE L, R	7.18
ENG FUEL VALVE L, R	7.19
Eng In-Flight Start L, R	7.20
Eng In-Flight Start L, R	7.22
ENG LIMIT EXCEED L, R	7.4
ENG LIMIT PROT L, R.....	7.23
ENG OIL FILTER L, R.....	7.24
ENG OIL PRESS L, R	7.28
ENG OIL TEMP L, R.....	7.32
ENG OIL TEMP L, R.....	7.35
ENG REV AIR/GND	7.37
ENG REV COMMANDED L, R	7.37
ENG REV LIMITED L, R.....	7.38
ENG REVERSER L, R	7.38
ENG RPM LIMITED L, R	7.38
ENG SEC AIR VLV L, R	7.39
ENG SHUTDOWN	7.39

ENG SHUTDOWN L, R	7.39
ENG START CUTOUT L, R	7.40
ENG STARTERS L, R	7.40
ENG SURGE L, R	7.7
Eng Svr Damage/Sep L, R	7.8
ENG TBV OPEN L, R	7.41
ENG THRUST HIGH L, R	7.42
ENG THRUST L, R	7.41
EQUIP CLG OVRD AFT	2.6
EQUIP CLG OVRD FWD	2.7
EQUIP COOLING AFT	2.7
EQUIP COOLING FWD	2.8
EQUIP OVBD VLV AFT	2.8
EQUIP OVRD VLV AFT, FWD	2.9
EVAC COMMAND	1.6
Evacuation	Back Cover.2

F

FD DOOR AUTO UNLOCK	1.1
FD DOOR LOCK FAIL	1.6
FD DOOR OPEN	1.6
FIRE APU	8.1
FIRE CARGO AFT	8.14
FIRE CARGO FWD	8.16
FIRE ENG L, R	8.2
Fire Eng Tailpipe L, R	8.5
FIRE WHEEL WELL	8.18
FLAP/SLAT CONTROL	9.10

FLAPS DRIVE	9.6
FLAPS PRIMARY FAIL	9.8
FLIGHT CONTROL MODE	9.12
FLIGHT CONTROLS	9.16
FLT CONTROLS LOCKED	9.17
FMC HOLD AIRSPACE	11.3
FMC INTERCEPT HDG	11.4
FMC MESSAGE	11.4
FMC PERF UNAVAIL	11.4
FMC RUNWAY DISAGREE	11.4
FMC UNABLE RTA	11.5
FMC VERIFY POSITION	11.5
FMC	11.2
FUEL AUTO JETTISON	12.1
FUEL BALANCE SYS	12.4
FUEL CROSSFEED	12.6
FUEL DISAGREE	12.7
FUEL IMBALANCE	12.8
FUEL IN CENTER	12.9
FUEL JETT NOZZLE L, R	12.9
FUEL JETTISON MAIN	12.11
FUEL JETTISON SYS	12.12
Fuel Jettison	12.10
Fuel Leak	12.13
FUEL LOW CENTER	12.17
FUEL PRESS ENG L+R	12.19
FUEL PRESS ENG L, R	12.18
FUEL PUMP CENTER L, R	12.20

FUEL PUMP CTR L+R.....	12.21
FUEL PUMP L AFT, FWD	12.21
FUEL PUMP R AFT, FWD	12.21
FUEL QTY LOW	12.22
FUEL TEMP HIGH.....	12.25
FUEL TEMP LOW.....	12.26
FUEL VALVE APU	12.26

G

GEAR DISAGREE	14.3
GEAR DOOR	14.6
GEAR DRAG BRACE L, R.....	14.6
Gear Lever Locked Down.....	14.8
GEAR SIDE BRACE L, R	14.8
GND PROX SYS	15.3
GPS	11.5
GPWS FLAP OVRD	15.3
GPWS GEAR OVRD	15.4
GPWS TERR OVRD	15.4

H

HEAT PITOT C.....	3.6
HEAT PITOT L	3.6
HEAT PITOT L+C+R.....	3.7
HEAT PITOT R.....	3.7
HF DATALINK	5.1
HUD SNGL OPERATION	10.15
HUD SYS CAPT, F/O	10.15
HUD TAKEOFF	10.15

HYD OVERHEAT C1	13.1
HYD OVERHEAT C2	13.1
HYD OVERHEAT DEM L, R	13.1
HYD OVERHEAT PRI L, R	13.2
HYD PRESS C1	13.2
HYD PRESS C2	13.3
HYD PRESS DEM L, R	13.3
HYD PRESS PRI L, R	13.4
HYD PRESS SYS C	13.5
HYD PRESS SYS L	13.8
HYD PRESS SYS L+C	13.9
HYD PRESS SYS L+C+R	13.13
HYD PRESS SYS L+R	13.14
HYD PRESS SYS R	13.17
HYD PRESS SYS R+C	13.18
HYD QTY LOW C, L, R	13.21

I

ICE DETECTORS	3.7
ICING ENG	3.7
INSUFFICIENT FUEL	11.6
IRU ATT MODE L, R	11.7
IRU/AHRU MOTION	11.7

J

Jammed Flight Controls	9.18
------------------------------	------

L

LANDING ALTITUDE	2.9
LIQUID CLG QTY L, R	2.9

LIQUID COOLING L	2.10
LIQUID COOLING R	2.11
LNAV BANK ANGLE LIM	11.7
Loss of All Displays	10.8

M

MAIN BATTERY DISCH	6.10
MAIN BATTERY LOW	6.10

N

NAV AIR DATA SYS.....	11.8
NAV AIRSPEED DATA.....	11.12
NAV APPROACH GLS	11.15
NAV APPROACH ILS	11.16
NAV INERTIAL SYS.....	11.17
NAV IRU	11.21
NAV SINGLE GPS	11.22
NAV UNABLE RNP.....	11.22
NO AUTOLAND	4.3
NO AUTOLAND GLS	4.3
NO AUTOLAND ILS	4.3
NO LAND 3	4.4
NOSE WHEEL STEERING	14.10

O

OUTFLOW VALVE AFT, FWD	2.12
OVERHEAT ENG L, R.....	8.20
OVERHEAT WHEEL WELL.....	8.23
OVERHEAT WING	3.8
OVERSPEED	15.4

Overweight Landing 0.6

P

PACK ALTITUDE LIMIT2.12

PACK L+R2.14

PACK L, R.....2.13

PACK MODE L, R2.16

PASS OXYGEN ON 1.7

PILOT RESPONSE15.4

PITCH DOWN AUTHORITY.....9.19

PITCH UP AUTHORITY9.20

PRI FLIGHT COMPUTERS9.22

R

RADIO TRANSMIT CAPT, F/O, OBS..... 5.1

RAT UNLOCKED 13.21

RECIRC FAN LWR, UPR OFF2.16

ROLL LEFT AUTHORITY9.26

ROLL RIGHT AUTHORITY9.28

ROLL/YAW ASYMMETRY.....9.29

RWY/APP CRS ERROR 11.23

RWY/APP TUNE ERROR..... 11.23

S

SATCOM 5.2

SATCOM DATALINK 5.2

SATVOICE LOST 5.2

SGL SOURCE APPROACH 11.24

SGL SOURCE ATTITUDE 10.16

SGL SOURCE RAD ALT 10.16

SINGLE FMC	11.23
SINGLE SOURCE FD	11.24
SLATS DRIVE.....	9.30
SLATS PRIMARY FAIL.....	9.31
SMOKE EQUIP CLG AFT	8.24
SMOKE EQUIP CLG FWD.....	8.26
SMOKE EQUIP CLG MISC.....	8.28
SMOKE LAVATORY	8.31
Smoke or Fumes Removal	8.30
SMOKE REST UPR DR 1	8.32
SMOKE REST UPR DR 4.....	8.33
Smoke, Fire or Fumes	8.6
SPEEDBRAKE EXTENDED	9.31
SPOILER DRAG	9.32
SPOILER PAIRS.....	9.32
SPOILERS	9.33
STAB GREENBAND	9.34
STABILIZER	9.1
STABILIZER CUTOUT	9.35
STABILIZER L2	9.35
STABILIZER R2	9.35
STALL PROTECTION.....	9.36
T	
T/O THRUST DISAGREE	4.4
TAIL STRIKE.....	15.5
TAT Probe Icing	3.8
TCAS	15.5

TCAS OFF	15.5
TCAS RA CAPTAIN, F/O	15.6
TCP ALTN NAV	11.24
TERR POS	15.6
THRUST ASYM PROT	7.42
TILLER L, R	14.10
TIRE PRESS	14.10
TRANSPONDER	11.24
TRANSPONDER PANEL	11.25
TRIM AIR L, R	2.16

V

VENTILATION ALTN	2.17
VHF DATALINK	5.2
Volcanic Ash	7.43
Volcanic Ash	7.46

W

WEATHER RADAR SYS	11.25
Window Damage Fwd L, R	1.8
Window Damage Side L, R	1.9
WINDOW HEAT	3.11
WINDOW HEAT L, R FWD	3.12
WINDOW HEAT L, R SIDE	3.13
WINDSHEAR SYS	15.6
WING ANTI-ICE OFF	3.13

Normal Checklists

Chapter NC

PREFLIGHT

Oxygen. Tested, 100%
Flight instruments Heading___, Altimeter___
Parking brake Set
FUEL CONTROL switches CUTOFF

BEFORE START

Flight deck door Closed and locked
Passenger signs ___
MCP V2___, HDG/TRK___, ALT___
Takeoff speeds V1___, VR___, V2___
CDU preflight. Completed
Trim ___ Units, 0
Taxi and takeoff briefing Completed
BEACON ON

BEFORE TAXI

Anti-ice. ___
Recall Checked
Autobrake RTO
Flight controls. Checked
Ground equipment Clear

BEFORE TAKEOFF

Flaps ____

AFTER TAKEOFF

Landing gear UP

Flaps UP

DESCENT

Recall Checked

Notes Checked

Autobrake ____

Landing data VREF____, Minimums____

Approach briefing Completed

APPROACH

Altimeters ____

LANDING

Speedbrake ARMED

Landing gear DOWN

Flaps ____

SHUTDOWN

Hydraulic panelSet
Fuel pumpsOff
FlapsUP
Parking brake
FUEL CONTROL switchesCUTOFF
Weather radarOff

SECURE

IRSOff
Emergency lightsOff
PacksOff

DO NOT USE FOR FLIGHT

Intentionally
Blank

Table of Contents

Ditching	0.1
Overweight Landing	0.6

Table of Contents

Intentionally
Blank

Ditching

Condition: Ditching is needed.

- 1 Transponder. 7700
- 2 Transmit a Mayday. Report aircraft type, position, heading, altitude, and airspeed.
- 3 Advise the cabin to prepare for ditching.

▼ Continued on next page ▼

▼ Ditching continued ▼

4 Choose one:

◆ **At least one engine is running**, plan to do the following:

Jettison fuel to reduce VREF speed and improve flotation.

Ditch with the gear up.

Use flaps 30 and VREF 30 on final approach.

Touchdown on the upwind side and parallel to waves and swells.

►► **Go to step 7**

◆ **Both engines are failed**, plan to do the following:

Ditch with the gear up.

Set flaps up maneuvering speed + 20 knots until extending flaps for ditching.

If flaps are extended, use flaps 20 and VREF 30 + 20 knots on final approach.

Flaps 20 is needed for controllability in flare when both engines are failed.

Touchdown on the upwind side and parallel to waves and swells.

►► **Go to step 5**

5 Tuning and control panel GPWS key Push

6 GPWS FLAP OVRD line select key OVRD

7 Tuning and control panel GPWS key Push

▼ Continued on next page ▼

▼ Ditching continued ▼

8 GPWS GEAR OVRD line select key OVRD

9 GPWS TERR OVRD line select key OVRD

10 Don the life vests.

11 Fasten the seat belts and shoulder harnesses.

12 SEAT BELT SIGNS selector ON

13 **Review** the following touchdown techniques:

If thrust is available, set a 200-300 FPM descent rate until the start of flare.

Flare for a minimum descent rate at touchdown.

Rotate smoothly to a 10-12 degree attitude at touchdown.

14 Do **not** accomplish the following **normal** checklists:

DESCENT

APPROACH

LANDING

▼ Continued on next page ▼

▼ Ditching continued ▼

15 **When** below 5,000 feet:

PACK switches (both) Off
 OUTFLOW VALVE switches (both) MAN
 OUTFLOW VALVE MANUAL
 switches (both) Push to CLOSE
 and hold until the
 outflow valve indications show fully closed
 Water will enter the airplane through an
 open outflow valve.

16 Start flap extension as needed.

17 Transmit the ditching position.

18 **Review** the after touchdown procedure:

Move both FUEL CONTROL switches to CUTOFF.
 Override and pull the APU fire switch.
 Advise the cabin to evacuate.

Do not accomplish the Evacuation checklist.

19 **When** on final approach:

Landing gear lever. **UP**
 Advise the cabin to brace for impact.
 Rotate smoothly to a 10-12 degree attitude at
 touchdown.

20 Do not accomplish the Evacuation checklist.

▼ Continued on next page ▼

▼ Ditching continued ▼

21 Do **not** accomplish the following checklists:

PACK L+R

CABIN ALTITUDE AUTO

OUTFLOW VALVE AFT

OUTFLOW VALVE FWD

CHKL INCOMPLETE NORM



I

Overweight Landing

Condition: A landing at greater than maximum landing weight is needed.

1 Refer to the Landing Climb Limit Weight table in the Performance Inflight chapter.

2 Choose one:

◆ Landing gross weight is **greater** than the Landing Climb Limit Weight, **or one engine is inoperative**:

Tuning and control panel

GPWS key Push

GPWS FLAP OVRD

line select key OVRD

Note: Use flaps 20 and VREF 20 for landing and flaps 5 for go-around. This provides greater climb capability.

▶▶ **Go to step 5**

◆ Landing gross weight is **less** than the Landing Climb Limit Weight, **and both engines are running normally**:

▶▶ **Go to step 3**

3 Enter the landing gross weight on the APPROACH REF page.

▼ Continued on next page ▼

▼ Overweight Landing continued ▼

4 Choose one:

- ◆ VREF 30 + additives (wind and gusts, 5 knots minimum) is **at or below** 160 knots:

Note: Use flaps 30 and VREF 30 for landing and flaps 20 for go-around.



- ◆ VREF 30 + additives (wind and gusts, 5 knots minimum) is **above** 160 knots:

Note: Use flaps 25 and VREF 25 for landing and flaps 20 for go-around. This provides greater margin to the flap placard speed.

Limit the additives for wind and gusts to 15 knots.

►► **Go to step 5**

5 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ Overweight Landing continued ▼

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake ____
- Landing data **VREF 20, 25 or 30**
Minimums ____
- Approach briefing Completed

Approach Checklist

- Altimeters ____

Landing Checklist

- Speedbrake ARMED
- Landing gear DOWN
- Flaps **20, 25, or 30**



Table of Contents

FD DOOR AUTO UNLOCK 1.1

CREW OXYGEN LOW 1.1

DOOR AFT, FWD CARGO 1.2

DOOR AFT, FWD E/E ACCESS 1.4

DOOR BULK CARGO 1.4

DOOR ENTRY 1-4L, R 1.4

DOOR FD OVHD 1.5

DOOR FWD ACCESS 1.5

DOORS 1.5

ELT ON 1.5

EMER LIGHTS 1.6

EVAC COMMAND 1.6

FD DOOR AUTO UNLOCK 1.1

FD DOOR LOCK FAIL 1.6

FD DOOR OPEN 1.6

PASS OXYGEN ON 1.7

Window Damage Fwd L, R 1.8

Window Damage Side L, R 1.9

Table of Contents

Intentionally
Blank

[] FD DOOR AUTO UNLOCK

Condition: The correct emergency access code is entered.

- 1 FD DOOR ACCESS selector Rotate to DENY and hold for 1 second

**CREW OXYGEN LOW**

Condition: Crew oxygen pressure is low.



[] DOOR AFT, FWD CARGO

Condition: The affected cargo door is not closed and secure.

Objective: To reduce the cabin differential pressure to decrease the risk of door separation.

1 LDG ALT selectorPULL ON, set 8000

2 Choose one:

◆ Airplane altitude is **at or below** 8,000 feet:

Level off at the lowest safe altitude.

▶▶ **Go to step 3**

◆ Airplane altitude is **above** 8,000 feet:

Descend to the lowest safe altitude or 8,000 feet, whichever is higher.

▶▶ **Go to step 3**

3 **After** level off, allow sufficient time for the cabin altitude to stabilize. This minimizes discomfort when the airplane is depressurized.

▼ Continued on next page ▼

▼ DOOR AFT, FWD CARGO continued ▼

4 Choose one:

◆ Airplane altitude is **at or below** 10,000 feet:

▶▶ **Go to step 5**

◆ Airplane altitude is **above** 10,000 feet:

Don the oxygen masks.

Establish crew communications.

▶▶ **Go to step 5**

5 OUTFLOW VALVE switches (both) MAN

6 OUTFLOW VALVE

MANUAL switches (both) Push to OPEN and
hold until the outflow
valve indications show fully
open to depressurize the airplane

7 **After** the airplane is depressurized, the crew may
change altitude as needed.

8 Do **not** accomplish the following checklists:

CABIN ALTITUDE AUTO

LANDING ALTITUDE



[] DOOR AFT, FWD E/E ACCESS

Condition: The affected electrical and electronic access door is not closed and secure.

Note: The door is in a safe configuration as long as cabin pressurization is normal. Positive cabin differential pressure ensures the door stays in place.

**[] DOOR BULK CARGO**

Condition: The bulk cargo door is not closed and secure.

Note: The bulk cargo door is in a safe configuration as long as cabin pressurization is normal. Positive cabin differential pressure ensures the door stays in place.

**[] DOOR ENTRY 1–4L, R**

Condition: An entry door is not closed and secure.

Note: The door is in a safe configuration as long as cabin pressurization is normal. Positive cabin differential pressure ensures the door stays in place.



[] DOOR FD OVHD

Condition: The flight deck overhead door is not closed and secure.

Note: The flight deck overhead door is in a safe configuration as long as cabin pressurization is normal. Positive cabin differential pressure ensures the door stays in place.

**[] DOOR FWD ACCESS**

Condition: The forward access door is not closed and secure.

Note: The forward access door is in a safe configuration as long as cabin pressurization is normal. Positive cabin differential pressure ensures the door stays in place.

**DOORS**

Condition: Two or more doors are not closed and secure.

**ELT ON**

Condition: The emergency locator transmitter is on.



EMER LIGHTS

Condition: One of these occurs:

- The emergency lights are on
- The emergency lights switch is not ARMED



EVAC COMMAND

Condition: The evacuation command signal is on.



[] FD DOOR LOCK FAIL

Condition: One or more of these occur:

- The flight deck door power is off
- The lock is failed

Objective: To remove electrical power from the lock to prevent possible overheating.

- 1 FD DOOR POWER switch Off
- 2 The door can be locked with the deadbolt.



FD DOOR OPEN

Condition: The flight deck door is open.



PASS OXYGEN ON

Condition: The passenger oxygen system is on.



Window Damage Fwd L, R

Condition: The affected forward flight deck window has one or more of these:

- An electrical arc
- A delamination
- A crack
- Is shattered

Objective: To remove electrical power, if needed, to prevent arcing. To descend, if needed, to minimize forces on the window.

- 1 **If** a forward window is arcing, shattered, or cracked:

FWD PRIMARY WINDOW HEAT switch
(affected window) Off

Do **not** accomplish the following checklist:

WINDOW HEAT FWD (affected window)

- 2 **If** a damaged window is deformed, or an air leak occurs:

Plan to land at the nearest suitable airport.

If the airplane altitude is above 10,000 feet:

Descend to the lowest safe altitude or 10,000 feet, whichever is higher.

Note: Sustained flight below 10,000 feet is not recommended due to greater risk of bird strike.



Window Damage Side L, R

Condition: The affected side flight deck window has one or more of these:

- An electrical arc
- A delamination
- A crack
- Is shattered

Objective: To descend, if needed, to minimize forces on the window.

- 1 **If** a damaged window is deformed, or an air leak occurs:

Plan to land at the nearest suitable airport.

If the airplane altitude is above 10,000 feet:

Descend to the lowest safe altitude or 10,000 feet, whichever is higher.

Note: Sustained flight below 10,000 feet is not recommended due to greater risk of bird strike.



Intentionally
Blank

Table of Contents

CABIN ALTITUDE2.1

CABIN ALTITUDE2.1

CABIN ALTITUDE AUTO2.2

CABIN TEMPERATURE2.4

CARGO A/C FWD2.6

CARGO HEAT BULK, FWD2.6

EQUIP CLG OVRD AFT2.6

EQUIP CLG OVRD FWD.....2.7

EQUIP COOLING AFT2.7

EQUIP COOLING FWD2.8

EQUIP OVBD VLV AFT2.8

EQUIP OVRD VLV AFT, FWD.....2.9

LANDING ALTITUDE2.9

LIQUID CLG QTY L, R.....2.9

LIQUID COOLING L2.10

LIQUID COOLING R2.11

OUTFLOW VALVE AFT, FWD2.12

PACK ALTITUDE LIMIT2.12

PACK L, R2.13

PACK L+R2.14

PACK MODE L, R2.16

RECIRC FAN LWR, UPR OFF2.16

TRIM AIR L, R.....2.16

VENTILATION ALTN2.17

Table of Contents

Intentionally
Blank

[] CABIN ALTITUDE

Condition: Cabin altitude is excessive.

- 1 Don the oxygen masks.
- 2 Establish crew communications.
- 3 Check the cabin altitude and rate.
- 4 **If** cabin altitude is uncontrollable:

PASS OXYGEN switch Push to ON
and hold
for 1 second

Without delay, descend to the lowest safe
altitude or 10,000 feet, whichever is higher.

To descend:

- Move the thrust levers to idle
- Extend the speedbrakes
- If structural integrity is in doubt, limit
airspeed and avoid high maneuvering loads
- Descend at Vmo/Mmo



[] CABIN ALTITUDE AUTO

Condition: One of these occurs:

- Automatic pressurization control is failed
- Both outflow valve switches are in manual

- 1
- OUTFLOW VALVE switches (both)MAN
- 2
- OUTFLOW VALVE MANUAL
switches (both) Push to OPEN
or CLOSE and hold
as needed to control
cabin rate and altitude

Note: The recommended cabin rate is approximately 500 FPM for climbs and descents.

Note: Recommended cabin altitude in cruise is:

FLIGHT LEVEL	CABIN ALTITUDE
Up to 230	Landing Field Elevation
260	2,000
300	4,000
350	6,000
400 and above	8,000

3 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked

Notes. Checked

▼ Continued on next page ▼

▼ CABIN ALTITUDE AUTO continued ▼

Autobrake _____

Landing data VREF ___, Minimums___

Approach briefing Completed

Approach Checklist

Altimeters _____

When at pattern altitude:

OUTFLOW VALVE MANUAL

switches (both) Push to OPEN and
hold until the outflow
valve indications show fully open

Landing Checklist

Speedbrake ARMED

Landing gear DOWN

Flaps _____



[] CABIN TEMPERATURE

Condition: Flight deck or cabin temperature is excessively hot or cold. The temperature may cause incapacitation.

Objective: To descend and configure to provide alternate ventilation before the cabin or flight deck temperature causes incapacitation.

1 TRIM AIR switches (both) Off

2 **If** airplane altitude is above 10,000 feet:

Start a descent to the lowest safe altitude or 10,000 feet, whichever is higher. Use the speedbrakes to increase rate of descent, if needed.

3 Choose one:

◆ Flight deck or cabin temperature is **too warm**:

►► **Go to step 4**

◆ Flight deck or cabin temperature is **not** too warm:

►► **Go to step 9**

4 IFE/PASS SEATS power switch Off

5 CABIN/UTILITY power switch Off

6 SHOULDER and FOOT HEATERS
controls (all) LOW

7 Minimize flight deck lighting intensity.

8 During daylight, install the flight deck sun visors.

▼ Continued on next page ▼

▼ CABIN TEMPERATURE continued ▼

- 9 Plan to land at the nearest suitable airport.
- 10 **When** at level off:
- 11 **If** airplane altitude is above 10,000 feet:
 - Don the oxygen masks.
 - Establish crew communications.
- 12 PACK switches (both) Off
- 13 VENTILATION switch ALTN
- 14 **Wait** 30 seconds.
- 15 OUTFLOW VALVE switches (both) MAN
- 16 FWD OUTFLOW VALVE
 - MANUAL switch Position
the outflow valve to
the 10 o'clock position
- 17 AFT OUTFLOW VALVE
 - MANUAL switch Hold in OPEN until the
outflow valve is fully open
- 18 Open the flight deck door.
- 19 If needed to reduce flight deck temperature, open
the flight deck overhead vent.

▼ Continued on next page ▼

▼ **CABIN TEMPERATURE continued** ▼

20 Do **not** accomplish the following checklists:

PACK L+R

TRIM AIR L

TRIM AIR R

CABIN ALTITUDE

CABIN ALTITUDE AUTO

**CARGO A/C FWD**

Condition: Forward cargo air conditioning is inoperative.

**[] CARGO HEAT BULK, FWD**

Condition: The affected cargo heat is inoperative.

Note: The temperature in the affected cargo compartment will stay above freezing.

**[] EQUIP CLG OVRD AFT**

Condition: The aft equipment cooling system is in override mode.

Note: After 30 minutes of operation at low altitude and low cabin differential pressure, non-critical electronic equipment may fail.



[] EQUIP CLG OVRD FWD

Condition: The forward equipment cooling system is in override mode.

Note: After 30 minutes of operation at low altitude and low cabin differential pressure, non-critical electronic equipment may fail.

The forward cargo heat is inoperative. The temperature in the forward cargo compartment will stay above freezing.

- 1 Do **not** accomplish the following checklist:

CARGO HEAT FWD

**[] EQUIP COOLING AFT**

Condition: The aft equipment cooling system is inoperative.

- 1 Plan to land at the nearest suitable airport.

Note: After 30 minutes, non-critical electronic equipment may fail.



[] EQUIP COOLING FWD

Condition: The forward equipment cooling system is inoperative.

- 1 Plan to land within 345 minutes.

Note: After 345 minutes, critical electronic equipment may fail.

Note: After 30 minutes, non-critical electronic equipment and EFB displays may fail.

- 2 TCP MENU key Push

- 3 SYS POWER key Push

Note: Each component (weather radar, GPWS and transponder/TCAS) may function for as little as 15 minutes before failing. By using both L and R side components, a total of 30 minutes of operation is possible for each function. Select functions OFF when they are not needed for safe operation. Operate one side (L or R) at a time when needed.



EQUIP OVBD VLV AFT

Condition: The aft equipment cooling system overboard exhaust valve is failed in the open position on the ground.



EQUIP OVRD VLV AFT, FWD

Condition: The affected equipment cooling system override valve is failed on the ground.

**[] LANDING ALTITUDE**

Condition: One of these occurs:

- The FMC does not supply a landing altitude
- The landing altitude selector is pulled

1 LDG ALT selector PULL ON, set manually

**LIQUID CLG QTY L, R**

Condition: The affected liquid cooling system quantity is low.



[] LIQUID COOLING L

Condition: A left liquid cooling system fault occurs.

Note: Cooling for the large motor power system may not be available. The following items may be inoperative:

- L pack
- L center fuel pump
- C1 electric pump
- R demand hydraulic pump

Equipment may become operative or inoperative later in the flight. Leave all controls in the normal positions.

1 Do **not** accomplish the following checklists:

PACK L

FUEL PUMP CENTER L

HYD PRESS C1

HYD PRESS DEM R



[] LIQUID COOLING R

Condition: A right liquid cooling system fault occurs.

Note: Cooling for the large motor power system may not be available. The following items may be inoperative:

- R pack
- R center fuel pump
- C2 electric pump
- L demand hydraulic pump

Equipment may become operative or inoperative later in the flight. Leave all controls in the normal positions.

1 Do **not** accomplish the following checklists:

PACK R

FUEL PUMP CENTER R

HYD PRESS C2

HYD PRESS DEM L



[] OUTFLOW VALVE AFT, FWD

Condition: One of these occurs:

- Automatic control of the affected outflow valve is inoperative
- The affected outflow valve switch is in manual

Objective: To allow the operable outflow valve to control cabin pressure.

- 1 OUTFLOW VALVE switch (affected side) MAN
- 2 OUTFLOW VALVE MANUAL
switch (affected side) Push to CLOSE and
hold for 30 seconds
or until the outflow valve
indication shows fully closed

**[] PACK ALTITUDE LIMIT**

Condition: Airplane altitude is limited because pack flow is too low and the equipment cooling system is in the override mode.

- 1 **If** airplane altitude is above 35,000 feet:
Descend to 35,000 feet or lower.

Note: Maintain altitude at or below 35,000 feet. Cabin temperature may be higher than normal.



[] PACK L, R

Condition: The affected pack is inoperative.

- 1 **Wait** 2 minutes. This allows time for an overheat condition to cool.
- 2  **Attempt only one reset.**
AIR COND RESET switch. Push and hold
for 1 second
- 3 Leave the PACK switch in AUTO for the rest of the flight.

This allows the pack to run if power is restored.

Note: Single pack operation may prevent pressurization up to the airplane's maximum operating altitude. Pressurization can be maintained at lower altitudes.



[] PACK L+R

Condition: Both packs are inoperative.

Objective: To prevent excessive cabin altitude and temperature by descending and increasing ventilation.

- 1 Don the oxygen masks.
- 2 Establish crew communications.
- 3 **Without delay**, start a descent to the lowest safe altitude or 10,000 feet, whichever is higher.

To descend:

- Move the thrust levers to idle
- Extend the speedbrakes
- If structural integrity is in doubt, limit airspeed and avoid high maneuvering loads
- Descend at Vmo/Mmo

- 4 Plan to land at the nearest suitable airport.
- 5 AIR COND RESET switch Push and hold for 1 second
- 6 **Wait** 2 minutes unless the PACK L+R message shows again.
- 7 Choose one:

◆ PACK L+R message **blanks**:



◆ PACK L+R message **shows**:

►► **Go to step 8**

▼ **Continued on next page** ▼

- 8 IFE/PASS SEATS power switch Off
- 9 CABIN/UTILITY power switch Off
- 10 SHOULDER and FOOT HEATERS
controls (all) LOW
- 11 Minimize flight deck lighting intensity.
- 12 During daylight, install the flight deck sun visors.
- 13 **When** at level off:

►► **Go to step 14**

Note: Do not exceed 260 knots when the airplane is below 6,000 feet.

- 14 VENTILATION switch ALTN
- 15 **Wait** 30 seconds.
- 16 OUTFLOW VALVE switches (both) MAN
- 17 FWD OUTFLOW VALVE
MANUAL switch Position the
outflow valve to
the 10 o'clock position
- 18 AFT OUTFLOW VALVE
MANUAL switch Hold in OPEN
until the outflow
valve is fully OPEN
- 19 Open the flight deck door.
- 20 If needed to reduce flight deck temperature, open
the flight deck overhead vent.

▼ Continued on next page ▼

21 Do **not** accomplish the following checklist:

CABIN ALTITUDE AUTO



[] PACK MODE L, R

Condition: The affected pack is in the standby mode.

Note: At lower altitudes or higher outside air temperatures, the pack may shut down.



RECIRC FAN LWR, UPR OFF

Condition: The affected recirculation fan switch is Off.



[] TRIM AIR L, R

Condition: The trim air valve is closed.

- 1 **Wait** 2 minutes. This allows time for an overheat condition to cool.
- 2 AIR COND RESET switch Push and hold for 1 second
- 3 Wait 2 minutes.
- 4 **If** the TRIM AIR message shows again:
TRIM AIR switch (affected side) Off



VENTILATION ALTN

Condition: The alternate ventilation system is on.



Intentionally
Blank

Non-Normal Checklists

Chapter NNC

Anti-Ice, Rain

Section 3

Table of Contents

ANTI-ICE DET WING	3.1
ANTI-ICE ENG L, R.....	3.1
ANTI-ICE LEAK ENG L, R.....	3.2
ANTI-ICE LOSS ENG L, R	3.5
ANTI-ICE ON.....	3.5
ANTI-ICE PACKS.....	3.6
ANTI-ICE WING.....	3.6
HEAT PITOT C.....	3.6
HEAT PITOT L	3.6
HEAT PITOT L+C+R.....	3.7
HEAT PITOT R.....	3.7
ICE DETECTORS.....	3.7
ICING ENG	3.7
OVERHEAT WING	3.8
TAT Probe Icing	3.8
WINDOW HEAT	3.11
WINDOW HEAT L, R FWD	3.12
WINDOW HEAT L, R SIDE.....	3.13
WING ANTI-ICE OFF.....	3.13

Table of Contents

Intentionally
Blank

[] ANTI-ICE DET WING

Condition: Automatic control of wing anti-ice is failed.

Note: Run the wing anti-ice system manually.



[] ANTI-ICE ENG L, R

Condition: The affected engine anti-ice valve is closed when commanded open.

- 1 ENGINE ANTI-ICE selector (affected side) OFF, then ON

- 2 Choose one:

◆ ANTI-ICE ENG message **blanks**:

Note: Run the affected engine anti-ice system manually.



◆ ANTI-ICE ENG message **stays shown**:

►► **Go to step 3**

- 3 ENGINE ANTI-ICE selector (affected side) OFF

Note: Avoid icing conditions.



[] ANTI-ICE LEAK ENG L, R

Condition: A bleed air leak occurs in the affected engine anti-ice duct.

Objective: To reduce the flow of bleed air through the leak.

- 1 The engine anti-ice system automatically isolates the heat source within approximately 2 minutes by closing the engine anti-ice valve.

Note: Avoid icing conditions.

- 2 **Wait** 2 minutes.
- 3 ENGINE ANTI-ICE selector (affected side) OFF
- 4 Choose one:
 - ◆ ANTI-ICE LEAK ENG message **blanks**:

■ ■ ■ ■
 - ◆ ANTI-ICE LEAK ENG message **stays shown**:

▶▶ **Go to step 5**
- 5 A/T ARM switch (affected side). OFF
- 6 Thrust lever (affected side) Retard slowly until the ANTI-ICE LEAK ENG message blanks or the thrust lever is at idle

▼ Continued on next page ▼

▼ ANTI-ICE LEAK ENG L, R continued ▼

7 Choose one:

◆ ANTI-ICE LEAK ENG message **blanks**:

Note: Run the engine at a thrust setting that keeps the ANTI-ICE LEAK ENG message blank.



◆ ANTI-ICE LEAK ENG message **stays shown**:

►► **Go to step 8**

8 TRANSPONDER MODE selector TA ONLY

Note: Run the engine at idle for the rest of the flight.

9 Do **not** accomplish the following checklist:
AUTOTHROTTLE

▼ Continued on next page ▼

▼ ANTI-ICE LEAK ENG L, R continued ▼

10 Choose one:

- ◆ Landing using flaps **20**:
 - Tuning and control panel
 - GPWS key Push
 - GPWS FLAP OVRD
 - line select key OVRD

Note: Use flaps 20 and VREF 20 for landing and flaps 5 for go-around.

▶▶ Go to step 11

- ◆ Landing using flaps **30 (if performance allows)**:

Note: Use flaps 30 and VREF 30 for landing and flaps 20 for go-around.



11 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake ____
- | Landing data **VREF 20, Minimums** ____
- Approach briefing Completed

▼ Continued on next page ▼

▼ ANTI-ICE LEAK ENG L, R continued ▼

Approach Checklist

Altimeters _____

Landing Checklist

Speedbrake ARMED

Landing gear DOWN

Flaps. **20** |**ANTI-ICE LOSS ENG L, R**

Condition: Anti-ice bleed air for the affected engine is not available.

**[] ANTI-ICE ON**

Condition: All of these occur:

- An ANTI-ICE selector is ON
- TAT is more than 10 degrees C
- Ice is not detected

1 ENGINE ANTI-ICE
selectors (both) AUTO or OFF |

2 WING ANTI-ICE selector AUTO or OFF |



[] ANTI-ICE PACKS

Condition: Both pack inlet anti-ice systems are failed.

Note: Avoid icing conditions.

**[] ANTI-ICE WING**

Condition: Wing anti-ice is degraded or failed.

Note: Avoid icing conditions.

**[] HEAT PITOT C**

Condition: The center pitot probe heat is failed.

Note: The standby air data is unreliable in icing conditions.

**[] HEAT PITOT L**

Condition: The left pitot probe heat is failed.

Note: The PFD air data is not affected by the failure of one or two pitot heats.



[] HEAT PITOT L+C+R

Condition: The left, center, and right pitot probe heat is failed.

Note: The standby air data is unreliable in icing conditions.

**[] HEAT PITOT R**

Condition: The right pitot probe heat is failed.

Note: The PFD air data is not affected by the failure of one or two pitot heats.

**[] ICE DETECTORS**

Condition: The ice detectors are failed.

Note: Run the engine and wing anti-ice systems manually.

**ICING ENG**

Condition: Ice is detected and an engine anti-ice selector is OFF.



[] OVERHEAT WING

Condition: A wing anti-ice overheat occurs.

- 1 WING ANTI-ICE selector OFF

Note: Avoid icing conditions.

- 2 Do **not** accomplish the following checklist:

WING ANTI-ICE OFF

**TAT Probe Icing**

Condition: Icing of the airplane TAT probe or engine TAT probe is suspected. (Indications of TAT probe icing are listed in the Additional Information section of this checklist.)

Objective: To use the alternate EEC mode calculated temperature instead of an incorrect TAT.

- 1 Autothrottle disconnect switch Push
- 2 Thrust levers (both) Retard to mid position

This prevents exceeding thrust limits when switching to the alternate mode.

- 3 L EEC MODE switch Off
- 4 R EEC MODE switch Off
- 5 Thrust levers (both) Set to maintain the
needed airspeed and
rate of climb or descent

▼ Continued on next page ▼

▼ TAT Probe Icing continued ▼

Note: Maximum thrust limiting is not available in the alternate mode. Alternate thrust setting information shows on the N1 indications.

6 Choose one:

◆ TAT stays **constant and near** 0 degrees C:

Airplane TAT probe icing is possible.

Note: Reference/target N1 indication, reference N1 indication, and maximum N1 indication may be temporarily unreliable.

Do not exceed EGT caution limits.

Do **not** accomplish the following checklists:

ENG LIMIT PROT L

ENG LIMIT PROT R

►► **Go to step 7**

◆ TAT is **not** near 0 degrees C:

Engine TAT probe icing is possible.

Note: Airplane TAT is reliable.

Reference/target N1 indication, reference N1 indication, and maximum N1 indication are reliable if shown.

►► **Go to step 7**

▼ Continued on next page ▼

▼ TAT Probe Icing continued ▼

7 Do **not** accomplish the following checklists:

ENG EEC MODE L

ENG EEC MODE R

Note: The autothrottle may be re-engaged when:

- The reference/target N1 and reference N1 indications show
- TAT is not near 0 degrees C



[Option – GE engines]

Additional Information

One or more of the following may be an indication of TAT probe icing:

- The TAT indication stays constant and near 0 degrees C during climb, cruise, or descent
- The autothrottle disconnects and the reference/target N1 and reference N1 indications are blank
- The thrust levers are not aligned with the engine N1 indications
- The engine N1 indications are not equal when the thrust levers are aligned
- A decrease or increase in the reference/target N1 shows at a constant altitude and speed
- The engines are unable to achieve the maximum continuous or the maximum climb rating with thrust levers fully forward

▼ Continued on next page ▼

▼ TAT Probe Icing continued ▼

[Option – RR engines]

Additional Information

One or more of the following may be an indication of TAT probe icing:

- The TAT indication stays constant and near 0 degrees C during climb, cruise, or descent
- The autothrottle disconnects and the reference/target TPR and reference TPR indications are blank
- The thrust levers are not aligned with the engine TPR indications
- The engine TPR indications are not equal when the thrust levers are aligned
- A decrease or increase in the reference/target TPR shows at a constant altitude and speed
- The engines are unable to achieve the maximum continuous or the maximum climb rating with thrust levers fully forward

WINDOW HEAT

Condition: Two or more window heats are off.



[] WINDOW HEAT L, R FWD

Condition: Primary window heat for the affected forward window is inoperative.

Objective: To reset the system or remove power to prevent arcing.

- 1 FWD PRIMARY WINDOW HEAT
switch (affected side) Off
- 2 FWD PRIMARY
WINDOW HEAT switch
(affected side) Wait 10 seconds, then ON
- 3 Choose one:
 - ◆ WINDOW HEAT FWD message **blanks**:

■ ■ ■ ■
 - ◆ WINDOW HEAT FWD message **stays shown**:
 FWD PRIMARY WINDOW HEAT
 switch (affected side) Off

 The window is defogged by the backup
 system.

■ ■ ■ ■

[] WINDOW HEAT L, R SIDE

Condition: Primary window heat for the affected side window is inoperative.

Objective: To reset the system or remove power to prevent arcing.

- 1 SIDE PRIMARY WINDOW HEAT
switch (affected side) Off
- 2 SIDE PRIMARY
WINDOW HEAT switch
(affected side) Wait 10 seconds, then ON
- 3 Choose one:
 - ◆ WINDOW HEAT SIDE message **blanks**:

■ ■ ■ ■
 - ◆ WINDOW HEAT SIDE message **stays shown**:

SIDE PRIMARY WINDOW HEAT
switch (affected side) Off

■ ■ ■ ■

[] WING ANTI-ICE OFF

Condition: The wing anti-ice selector is OFF.



Intentionally
Blank

Table of Contents

AUTOPILOT	4.1
AUTOPILOT DISC	4.1
AUTOTHROTTLE DISC	4.1
AUTOTHROTTLE L, R.....	4.1
A/P BACKDRIVE COLUMN	4.2
A/P BACKDRIVE PEDAL	4.2
A/P BACKDRIVE WHEEL	4.3
NO AUTOLAND.....	4.3
NO AUTOLAND GLS	4.3
NO AUTOLAND ILS	4.3
NO LAND 3.....	4.4
T/O THRUST DISAGREE	4.4

Table of Contents

Intentionally
Blank

AUTOPILOT

Condition: One or more of these occur:

- The autopilot is in a degraded mode other than the selected mode
- The engaged roll mode is failed
- The engaged pitch mode is failed
- The autopilot is in flight envelope protection

**AUTOPILOT DISC**

Condition: All autopilots are disconnected.

**AUTOTHROTTLE DISC**

Condition: Both autothrottles are disconnected.

**[] AUTOTHROTTLE L, R**

Condition: The affected autothrottle is inoperative.

- 1 A/T ARM switch (affected side). OFF
- 2 The other autothrottle may be re-engaged if needed.



[] A/P BACKDRIVE COLUMN

Condition: The autopilot can no longer backdrive the control column to match the position of the elevator.

- 1 Autopilot operation is not affected.

Note: Control column force override of the autopilot requires much less force.

**[] A/P BACKDRIVE PEDAL**

Condition: The autopilot can no longer backdrive the rudder pedals to match the position of the rudder during autoland approaches.

- 1 Autopilot operation is not affected.

Note: Rudder pedal force override of the autopilot requires much less force.

If the autopilot is disconnected during the autoland alignment maneuver, expect a minor flight path change because the pedal and rudder positions are mismatched.



[] A/P BACKDRIVE WHEEL

Condition: The autopilot can no longer backdrive the control wheel to match the position of the ailerons.

- 1 Autopilot operation is not affected.

Note: Control wheel force override of the autopilot requires much less force.

If the autopilot is disconnected during the autoland alignment maneuver, expect a minor flight path change because the wheel and aileron positions are mismatched.

Bank angle protection is inoperative.

**NO AUTOLAND**

Condition: The autoland system is not available.

**NO AUTOLAND GLS**

Condition: The autoland system is not available for a GLS approach.

**NO AUTOLAND ILS**

Condition: The autoland system is not available for an ILS approach.



NO LAND 3

Condition: The autoland system does not have redundancy for a triple channel autoland.

**T/O THRUST DISAGREE**

Condition: The thrust management takeoff thrust calculation disagrees with the EEC takeoff thrust calculation.



Table of Contents

DATALINK LOST	5.1
DATALINK SYS.....	5.1
HF DATALINK	5.1
RADIO TRANSMIT CAPT, F/O, OBS	5.1
SATCOM	5.2
SATCOM DATALINK	5.2
SATVOICE LOST.....	5.2
VHF DATALINK	5.2

Table of Contents

Intentionally
Blank

DATALINK LOST

Condition: The ACARS datalink is temporarily lost.

**DATALINK SYS**

Condition: The datalink system is failed.

**HF DATALINK**

Condition: The HF datalink is failed.

**[] RADIO TRANSMIT CAPT, F/O, OBS**

Condition: One of the affected microphone switches transmits for 30 seconds.

Objective: To isolate the stuck microphone switch.

- 1 Transmitter select switches (affected panel)FLT interphone
- 2 The microphone with the stuck switch transmits on the flight interphone rather than transmitting over a radio.

Note: The affected audio control panel transmitter selector switches should stay on FLT interphone. All other audio panels may be used normally.



SATCOM

Condition: The SATCOM system is failed.

**SATCOM DATALINK**

Condition: The SATCOM datalink is failed.

**SATVOICE LOST**

Condition: SATCOM voice communication is temporarily lost.

**VHF DATALINK**

Condition: The VHF datalink is failed.



Non-Normal Checklists

Chapter NNC

Electrical

Section 6

Table of Contents

ELEC AC BUS L1.....	6.1
ELEC AC BUS L2.....	6.2
ELEC AC BUS R1	6.4
ELEC AC BUS R2	6.6
ELEC BATTERY OFF.....	6.7
ELEC CABIN/UTIL OFF	6.7
ELEC GEN DRIVE L1, L2, R1, R2	6.8
ELEC GEN OFF APU L, R	6.8
ELEC GEN OFF L1, L2, R1, R2	6.9
ELEC IFE/SEATS OFF	6.9
ELEC STANDBY SYS.....	6.9
MAIN BATTERY DISCH	6.10
MAIN BATTERY LOW	6.10

Table of Contents

Intentionally
Blank

[] ELEC AC BUS L1

Condition: The L1 AC bus is not energized.

Objective: To restore power or use the APU to supply another source of power.

Attempt only one reset.

1  L1 GEN CTRL switch. Off, then ON

2 Choose one:

◆ ELEC AC BUS L1 message **blanks**:



◆ ELEC AC BUS L1 message **stays shown**:

▶▶ **Go to step 3**

3 APU selector
(if APU available) START, then ON

This supplies another source of electrical power to improve pack performance.

Note: Inoperative Items

C1 hydraulic pump inop

Left aft fuel pump inop

Captain's and first officer's HUDs inop

4 Do **not** accomplish the following checklists:

FUEL PUMP L AFT

HYD PRESS C1



[] ELEC AC BUS L2

Condition: The L2 AC bus is not energized.

Objective: To restore power or use the APU to supply another source of power.

Attempt only one reset.

1  L2 GEN CTRL switch. Off, then ON

2 Choose one:

◆ ELEC AC BUS L2 message **blanks**:



◆ ELEC AC BUS L2 message **stays shown**:

►► **Go to step 3**

3 APU selector
(if APU available) START, then ON

This supplies another source of electrical power for wing anti-ice.

▼ Continued on next page ▼

▼ ELEC AC BUS L2 continued ▼

Note: Inoperative Items**One or more spoilers inop**

Roll rate may be reduced in flight. Speedbrake effectiveness may be reduced in flight and during landing. Do not move the flap lever after landing. This prevents uncommanded movement.

Right demand hydraulic pump inop

Right thrust reverser deployment may be slower than normal.

Right aft fuel pump inop**L2 stabilizer inop**

- 4 Do **not** accomplish the following checklists:

SPOILERS

STABILIZER L2

FUEL PUMP R AFT

HYD PRESS DEM R



[] ELEC AC BUS R1

Condition: The R1 AC bus is not energized.

Objective: To restore power or use the APU to supply another source of power.

Attempt only one reset.

1  R1 GEN CTRL switch Off, then ON

2 Choose one:

◆ ELEC AC BUS R1 message **blanks**:



◆ ELEC AC BUS R1 message **stays shown**:

►► **Go to step 3**

3 APU selector
(if APU available) START, then ON

This supplies another source of electrical power to improve pack performance.

Note: Inoperative Items

C2 hydraulic pump inop

Right forward fuel pump inop

Captain's and first officer's HUDs inop

Forward cargo heat inop

The temperature in the forward cargo compartment will stay above freezing.

▼ Continued on next page ▼

▼ ELEC AC BUS R1 continued ▼

4 Do **not** accomplish the following checklists:

CARGO HEAT FWD

FUEL PUMP R FWD

HYD PRESS C2



[] ELEC AC BUS R2

Condition: The R2 AC bus is not energized.

Objective: To restore power or use the APU to supply another source of power.

Attempt only one reset.

1  R2 GEN CTRL switch Off, then ON

2 Choose one:

◆ ELEC AC BUS R2 message **blanks**:



◆ ELEC AC BUS R2 message **stays shown**:

►► **Go to step 3**

3 APU selector
(if APU available) START, then ON

This supplies another source of electrical power for wing anti-ice.

▼ Continued on next page ▼

▼ ELEC AC BUS R2 continued ▼

Note: Inoperative Items**One or more spoilers inop**

Roll rate may be reduced in flight. Speedbrake effectiveness may be reduced in flight and during landing. Do not move the flap lever after landing. This prevents uncommanded movement.

Left demand hydraulic pump inop

Left thrust reverser deployment may be slower than normal.

Left forward fuel pump inop**R2 stabilizer inop**

4 Do **not** accomplish the following checklists:

SPOILERS

STABILIZER R2

FUEL PUMP L FWD

HYD PRESS DEM L

**ELEC BATTERY OFF**

Condition: The battery switch is Off.

**ELEC CABIN/UTIL OFF**

Condition: The cabin/utility power switch is Off.



[] ELEC GEN DRIVE L1, L2, R1, R2

Condition: An affected generator drive fault occurs.

Action is irreversible.

- 1  DRIVE DISC switch
(affected generator). . . Confirm Push
and hold
for 1 second
- 2 APU selector (if APU available) . . . START, then ON
- 3 Do **not** accomplish the following checklist:
ELEC GEN OFF

**[] ELEC GEN OFF APU L, R**

Condition: The affected APU generator control breaker is open.

Attempt only one reset.

- 1  APU GEN switch
(affected generator). Off, then ON



[] ELEC GEN OFF L1, L2, R1, R2

Condition: The affected generator control breaker is open.

Objective: To reset the generator or use the APU to supply another source of power.

Attempt only one reset.

1  GEN CTRL switch
(affected generator) Off, then ON

2 Choose one:

◆ ELEC GEN OFF message **blanks**:



◆ ELEC GEN OFF message **stays shown**:

APU selector
(if APU available). START, then ON



ELEC IFE/SEATS OFF

Condition: The IFE/pass seats power switch is Off.



ELEC STANDBY SYS

Condition: A standby power system failure occurs.



MAIN BATTERY DISCH

Condition: One of these occurs:

- A main battery is discharging
- The hot battery bus is not energized

**MAIN BATTERY LOW**

Condition: The main battery charge is low.



Non-Normal Checklists

Chapter NNC

Engines, APU

Section 7

Table of Contents

Aborted Engine Start L, R.....	7.1
Dual Eng Fail/Stall	7.2
Dual Eng Fail/Stall	7.3
ENG AUTOSTART L, R	7.3
ENG LIMIT EXCEED L, R	7.4
ENG SURGE L, R	7.7
Eng Svr Damage/Sep L, R	7.8
- - - - -	
Aborted Engine Start L, R.....	7.1
APU LIMIT	7.10
APU SHUTDOWN	7.10
Dual Eng Fail/Stall	7.2
Dual Eng Fail/Stall	7.3
ENG AUTOSTART L, R	7.3
ENG CONTROL L, R.....	7.11
ENG CORE ANTI-ICE L, R	7.11
ENG EEC MODE L, R	7.12
ENG FAIL L, R.....	7.13
ENG FUEL FILTER L, R.....	7.17
ENG FUEL NOZZLE L, R.....	7.18
ENG FUEL VALVE L, R	7.18
ENG FUEL VALVE L, R	7.19
Eng In-Flight Start L, R	7.20
Eng In-Flight Start L, R	7.22
ENG LIMIT EXCEED L, R	7.4
ENG LIMIT PROT L, R.....	7.23

Table of Contents

ENG OIL FILTER L, R.....7.24

ENG OIL PRESS L, R7.28

ENG OIL TEMP L, R.....7.32

ENG OIL TEMP L, R.....7.35

ENG REV AIR/GND7.37

ENG REV COMMANDED L, R.....7.37

ENG REV LIMITED L, R.....7.38

ENG REVERSER L, R7.38

ENG RPM LIMITED L, R7.38

ENG SEC AIR VLV L, R7.39

ENG SHUTDOWN.....7.39

ENG SHUTDOWN L, R7.39

ENG START CUTOUT L, R.....7.40

ENG STARTERS L, R7.40

ENG SURGE L, R7.7

Eng Svr Damage/Sep L, R7.8

ENG TBV OPEN L, R7.41

ENG THRUST L, R.....7.41

ENG THRUST HIGH L, R7.42

THRUST ASYM PROT7.42

Volcanic Ash7.43

Volcanic Ash7.46

Aborted Engine Start L, R

Condition: During a ground start of the affected engine, an abort start condition occurs.

- 1 FUEL CONTROL switch
(affected side) CUTOFF
- - - - -
- 2 START selector (affected side) START
- 3 Motor the engine for 30 seconds.
- 4 START selector (affected side) NORM



Dual Eng Fail/Stall

[Option – GE engines]

Condition: Engine speed for both engines is below idle.

- 1 FUEL CONTROL switches
(both) CUTOFF, then RUN
- 2 RAM AIR TURBINE switch Push and hold
for 1 second
-
- 3 Set airspeed above 270 knots.
- 4 APU selector
(if APU available) START, then ON
- 5 The engines may accelerate to idle very slowly,
especially at high altitudes.
- 6 The time from fuel control switch to RUN to stable
idle may be as long as two and a half minutes. Slow
acceleration may be incorrectly interpreted as a
hung start or engine malfunction. If N2 is steadily
increasing and EGT stays within limits, the start is
progressing normally.



Dual Eng Fail/Stall

[Option – RR engines]

Condition: Engine speed for both engines is below idle.

- 1 FUEL CONTROL switches
(both) CUTOFF, then RUN
- 2 RAM AIR TURBINE switch Push and hold
for 1 second
-
- 3 Set airspeed above 250 knots.
- 4 APU selector
(if APU available) START, then ON
- 5 The engines may accelerate to idle very slowly,
especially at high altitudes.
- 6 Slow acceleration may be incorrectly interpreted as
a hung start or engine malfunction. If N2 is steadily
increasing and EGT stays within limits, the start is
progressing normally. Any further cycling of the
fuel control switches will result in longer start
times.



[] ENG AUTOSTART L, R

Condition: Autostart did not start the engine.

- 1 FUEL CONTROL switch
(affected side) CUTOFF
-
- 2 START selector (affected side) NORM



[] ENG LIMIT EXCEED L, R

Condition: An affected engine limit exceedance occurs.

- 1 A/T ARM switch
(affected side) Confirm OFF
- 2 Thrust lever
(affected side) Confirm Retard
until ENG LIMIT
EXCEED message blanks
or the thrust lever is at idle

3 Choose one:

◆ ENG LIMIT EXCEED message **blanks**:

►► **Go to step 4**

◆ ENG LIMIT EXCEED message **stays shown**:

FUEL CONTROL switch
(affected side) Confirm . . . CUTOFF

APU selector
(if APU available) START, then ON

TRANSPONDER MODE
selector TA ONLY

Plan to land at the nearest suitable airport.

►► **Go to step 5**

Check that RPM and EGT follow thrust lever movement.

- 4  Thrust lever
(affected side) Advance slowly

▼ Continued on next page ▼

▼ ENG LIMIT EXCEED L, R continued ▼

Note: Run the engine at a thrust setting that keeps the engine indications within limits.

5 Do **not** accomplish the following checklist:

AUTOTHROTTLE

6 Choose one:

◆ Landing using flaps **20**:

Tuning and control panel
GPWS key. Push

GPWS FLAP OVRD
line select key OVRD

Note: Use flaps 20 and VREF 20 for landing and flaps 5 for go-around.

►► **Go to step 7**

◆ Landing using flaps **30 (if performance allows)**:

Note: Use flaps 30 and VREF 30 for landing and flaps 20 for go-around.



7 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall Checked

Notes Checked

▼ Continued on next page ▼

▼ ENG LIMIT EXCEED L, R continued ▼

- Autobrake _____
- | Landing data **VREF 20, Minimums** _____
- Approach briefing Completed

Approach Checklist

- Altimeters _____

Landing Checklist

- Speedbrake ARMED
- Landing gear DOWN
- | Flaps **20**
 ■ ■ ■ ■

[] ENG SURGE L, R

Condition: An affected engine surge or stall that requires crew action is detected.

- 1 A/T ARM switch
(affected side) Confirm. OFF
- 2 Thrust lever
(affected side) Confirm. . . . Retard until
the ENG SURGE
message blanks or
the thrust lever is at idle

Check that RPM and EGT follow thrust lever movement.

- 3  Thrust lever
(affected side). Advance slowly

Note: Run the engine at a thrust setting that keeps the ENG SURGE message blank.

- 4 Do **not** accomplish the following checklist:
AUTOTHROTTLE



Eng Svr Damage/Sep L, R

Condition: One or more of these occur in the affected engine:

- Airframe vibrations with unusual engine indications
- Engine separation

- 1 A/T ARM switch
(affected side) Confirm OFF
- 2 Thrust lever
(affected side) Confirm Idle
- 3 FUEL CONTROL switch
(affected side) Confirm . . . CUTOFF
- 4 Engine fire switch
(affected side) Confirm Pull

- 5 **If** high airframe vibration occurs and continues after engine shutdown:

Without delay, reduce airspeed and descend to a safe altitude which results in an acceptable vibration level.

If high vibration returns and further airspeed reduction and descent are not practical, increasing the airspeed may reduce the vibration.

- 6 APU selector
(if APU available) START, then ON
- 7 TRANSPONDER MODE selector TA ONLY

▼ Continued on next page ▼

▼ Eng Svr Damage/Sep L, R continued ▼

8 Plan to land at the nearest suitable airport.

9 Do **not** accomplish the following checklists:

AUTOTHROTTLE

ENG FAIL

10 Choose one:

◆ Landing using flaps **20**:

Tuning and control panel

GPWS key. Push

GPWS FLAP OVRD

line select key OVRD

Note: Use flaps 20 and VREF 20 for landing and flaps 5 for go-around.

►► **Go to step 11**

◆ Landing using flaps **30 (if performance allows)**:

Note: Use flaps 30 and VREF 30 for landing and flaps 20 for go-around.



11 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked

Notes Checked

▼ Continued on next page ▼

▼ Eng Svr Damage/Sep L, R continued ▼

- Autobrake _____
- Landing data **VREF 20, Minimums** _____
- Approach briefing Completed

Approach Checklist

- Altimeters _____

Landing Checklist

- Speedbrake ARMED
- Landing gear DOWN
- Flaps **20**
■ ■ ■ ■

[] APU LIMIT

Condition: An APU limit exceedance occurs.

- 1 APU selector OFF
■ ■ ■ ■

[] APU SHUTDOWN

Condition: An APU automatic shutdown occurs.

Objective: To reset the APU controller.

- 1 APU selector OFF
- 2 APU selector START, then ON
■ ■ ■ ■

ENG CONTROL L, R

Condition: An EEC system fault occurs.



[] ENG CORE ANTI-ICE L, R

[Option – RR engines]

Condition: An engine core anti-ice fault occurs.

Note: Avoid icing conditions.



[] ENG EEC MODE L, R

Condition: An EEC is in the alternate control mode.

Objective: To run both engines in the alternate mode.

- 1 Autothrottle disconnect switch Push
- 2 Thrust levers (both) Retard to mid position

This prevents exceeding the thrust limits when switching to the alternate mode.

Push one switch at a time.

- 3  EEC MODE switches (both) Off
- 4 Engage the autothrottle.

Note: Maximum thrust limiting is not available with autothrottle disconnected. Alternate thrust setting information shows on the N1 indications.

- 5 Do **not** accomplish the following checklist:
ENG EEC MODE (for other engine)



[] ENG FAIL L, R

Condition: Engine speed is below idle.

Objective: To restart the engine if needed, or configure for single engine operation.

[Option – GE engines]

- 1 **If** thrust is lost on **both** engines:

▶▶ **Go to the Dual Eng Fail/Stall checklist on page 7.2**

[Option – RR engines]

- 2 **If** thrust is lost on **both** engines:

▶▶ **Go to the Dual Eng Fail/Stall checklist on page 7.3**

- 3 A/T ARM switch
(affected side) Confirm OFF
- 4 Thrust lever
(affected side) Confirm Idle
- 5 The engine will automatically attempt to relight. If N2 is above 30% and steadily increasing, the engine is starting.

▼ Continued on next page ▼

▼ ENG FAIL L, R continued ▼

6 Choose one:

◆ The engine is **starting**:

▶▶ **Go to step 14**

◆ After 1 minute, the engine stays **failed**:

FUEL CONTROL switch
(affected side) Confirm . . . CUTOFF

▶▶ **Go to step 7**

| 7 A restart may be attempted if there is no abnormal
airframe vibration.

8 Choose one:

◆ Restart is **needed**:

▶▶ **Go to step 9**

◆ Restart is **not** needed:

| ▶▶ **Go to step 14**

9 The engine may accelerate to idle very slowly,
especially at high altitudes.

[Option – GE engines]

10 The time from fuel control switch to RUN to stable
idle may be as long as two and a half minutes. Slow
acceleration may be incorrectly interpreted as a
hung start or engine malfunction. If N2 is steadily
increasing and EGT stays within limits, the start is
progressing normally.

▼ Continued on next page ▼

▼ ENG FAIL L, R continued ▼

[Option – RR engines]

11 Slow acceleration may be incorrectly interpreted as a hung start or engine malfunction. If N2 is steadily increasing and EGT stays within limits, the start is progressing normally. Any further cycling of the fuel control switches will result in longer start times.

12 Choose one:

◆ X-START is **shown**:

START selector (affected side) START |
FUEL CONTROL switch
(affected side) RUN

▶▶ **Go to step 14**

◆ X-START is **blank**:

▶▶ **Go to step 13**

13 FUEL CONTROL switch (affected side) RUN

14 Choose one:

◆ **Both** engines are **operating**:



◆ Engine stays **failed** or is **damaged**:

▶▶ **Go to step 15**

15 FUEL CONTROL switch
(affected side) Confirm CUTOFF

16 START selector
(affected side) NORM

▼ Continued on next page ▼

▼ **ENG FAIL L, R continued** ▼

17 APU selector

(if APU available) START, then ON

18 TRANSPONDER MODE selector TA ONLY

19 Plan to land at the nearest suitable airport.

20 Do **not** accomplish the following checklist:

AUTOTHROTTLE

21 Choose one:

◆ Landing using flaps **20**:

Tuning and control panel

GPWS key Push

GPWS FLAP OVRD

line select key OVRD

Note: Use flaps 20 and VREF 20 for landing
and flaps 5 for go-around.▶▶ **Go to step 22**◆ Landing using flaps **30 (if performance allows)**:**Note:** Use flaps 30 and VREF 30 for landing
and flaps 20 for go-around.**22 Checklist Complete Except Deferred Items**▼ **Continued on next page** ▼

▼ ENG FAIL L, R continued ▼

Deferred Items**Descent Checklist**

Recall Checked

Notes Checked

Autobrake ____

Landing data **VREF 20, Minimums** ____ |

Approach briefing Completed

Approach Checklist

Altimeters ____

Landing Checklist

Speedbrake ARMED

Landing gear DOWN

Flaps. **20** |**[] ENG FUEL FILTER L, R**

Condition: Fuel contamination in the affected engine can cause fuel to bypass the fuel filter.

Note: Erratic engine operation and flameout may occur in the affected engine due to fuel contamination.



ENG FUEL NOZZLE L, R

[Option – GE engines]

Condition: A valve in the engine fuel nozzle system is not in the commanded position.

**[] ENG FUEL VALVE L, R**

[Option – GE engines]

Condition: One or more of these occur in the affected engine:

- The engine fuel valve is not in the commanded position
- The fuel spar valve is not in the commanded position

1 If the ENG FUEL VALVE message shows when the fuel control switch is moved to CUTOFF, the engine may continue to run for approximately 20 seconds.

2 **If** on the ground:

Do not attempt engine start.



[] ENG FUEL VALVE L, R

[Option – RR engines]

Condition: One or more of these occur in the affected engine:

- The engine fuel valve is not in the commanded position
- The fuel spar valve is not in the commanded position

- 1 **If** the ENG FUEL VALVE message shows when the fuel control switch is moved to CUTOFF, the engine may continue to run for approximately 1 minute.
- 2 **If** on the ground:

Do not attempt engine start.



Eng In-Flight Start L, R

[Option – GE engines]

Condition: An engine start is needed after a shutdown and there is:

- No fire
- No abnormal airframe vibration

- 1 The engine may accelerate to idle very slowly, especially at high altitudes.
- 2 The time from fuel control switch to RUN to stable idle may be as long as two and a half minutes. Slow acceleration may be incorrectly interpreted as a hung start or engine malfunction. If N2 is steadily increasing and EGT stays within limits, the start is progressing normally.

- 3 Choose one:

◆ X-START is **shown**:

EICAS messages may show during the start due to load shed. Do the associated checklists only if the messages show after the engine start is complete.

START selector (affected side) START

FUEL CONTROL switch

(affected side) RUN

▶▶ **Go to step 5**

◆ X-START is **blank**:

▶▶ **Go to step 4**

- 4 FUEL CONTROL switch. RUN

▼ **Continued on next page** ▼

▼ Eng In-Flight Start L, R continued ▼

5 Choose one:

◆ Engine **starts** and runs normally:

Tuning and control panel

GPWS key. Push

GPWS FLAP OVRD

line select key NORM

TRANSPONDER MODE selector TA/RA



◆ Engine **fails to** start:

FUEL CONTROL switch

(affected side). . . Confirm CUTOFF

START selector

(affected side). NORM

Plan to land at the nearest suitable airport.



Eng In-Flight Start L, R

[Option – RR engines]

Condition: An engine start is needed after a shutdown and there is:

- No fire
- No abnormal airframe vibration

- 1 The engine may accelerate to idle very slowly, especially at high altitudes.
- 2 Slow acceleration may be incorrectly interpreted as a hung start or engine malfunction. If N2 is steadily increasing and EGT stays within limits, the start is progressing normally. Any further cycling of the fuel control switches will result in longer start times.
- 3 Choose one:

◆ X-START is **shown**:

EICAS messages may show during the start due to load shed. Do the associated checklists only if the messages show after the engine start is complete.

START selector (affected side) START
FUEL CONTROL switch
(affected side) RUN

►► **Go to step 5**

◆ X-START is **blank**:

►► **Go to step 4**

▼ Continued on next page ▼

▼ Eng In-Flight Start L, R continued ▼

4 FUEL CONTROL switch
(affected side) RUN

5 Choose one:

◆ Engine **starts** and runs normally:

Tuning and control panel
GPWS key. Push
GPWS FLAP OVRD line select key. . . NORM
TRANSPONDER MODE selector . . . TA/RA



◆ Engine **fails to** start:

FUEL CONTROL switch
(affected side). . . Confirm CUTOFF
START selector
(affected side). NORM
Plan to land at the nearest suitable airport.



[] ENG LIMIT PROT L, R

Condition: The EEC is in the alternate mode and
commanded N1 exceeds maximum N1.

1 Thrust lever
(affected side) Retard until
N1 stays below
the amber line



[] ENG OIL FILTER L, R**[Option – GE engines]**

Condition: Oil filter contamination can cause oil to bypass the oil filter.

Objective: To decrease oil pressure to stop filter bypass, or shut down the engine.

- 1 A/T ARM switch
(affected side) Confirm OFF
- 2 Thrust lever
(affected side) Confirm Retard
slowly until the
ENG OIL FILTER message
blanks or the thrust lever is at idle
- 3 Choose one:
 - ◆ ENG OIL FILTER message **blanks**:

Note: Run the affected engine at a thrust setting that keeps the ENG OIL FILTER message blank.

Do **not** accomplish the following checklists:

AUTOTHROTTLE

■ ■ ■ ■
 - ◆ ENG OIL FILTER message **stays shown**:

▶▶ **Go to step 4**
- 4 FUEL CONTROL switch
(affected side) Confirm CUTOFF

▼ Continued on next page ▼

▼ ENG OIL FILTER L, R continued ▼

- 5 APU selector
(if APU available) START, then ON
- 6 TRANSPONDER MODE selector TA ONLY
- 7 Plan to land at the nearest suitable airport.
- 8 Do **not** accomplish the following checklist:

AUTOTHROTTLE

- 9 Choose one:

◆ Landing using flaps **20**:

Tuning and control panel
GPWS key Push

GPWS FLAP OVRD
line select key OVRD

Note: Use flaps 20 and VREF 20 for landing
and flaps 5 for go-around.

▶▶ Go to step 10

◆ Landing using flaps **30 (if performance allows)**:

Note: Use flaps 30 and VREF 30 for landing
and flaps 20 for go-around.



10 Checklist Complete Except Deferred Items

▼ Continued on next page ▼

▼ ENG OIL FILTER L, R continued ▼

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake ____
- | Landing data **VREF 20, Minimums** ____
- Approach briefing Completed

Approach Checklist

- Altimeters ____

Landing Checklist

- Speedbrake ARMED
- Landing gear DOWN
- | Flaps **20**



Intentionally
Blank

[] ENG OIL PRESS L, R

Condition: The engine oil pressure is low.

- 1 A/T ARM switch
(affected side) Confirm OFF
- 2 Thrust lever
(affected side) Confirm Retard
slowly until
the ENG OIL PRESS message
blanks or the thrust lever is at idle
- 3 Do **not** accomplish the following checklists:
AUTOTHROTTLE
ENG OIL TEMP

▼ Continued on next page ▼

▼ ENG OIL PRESS L, R continued ▼

4 Choose one:

◆ ENG OIL PRESS message **blanks**:

Note: Run the engine at a thrust setting that keeps the ENG OIL PRESS message blank.



◆ ENG OIL PRESS message **stays shown**:

FUEL CONTROL switch
(affected side). . . Confirm CUTOFF
APU selector
(if APU available). START, then ON
TRANSPONDER MODE
selector TA ONLY
Plan to land at the nearest suitable airport.

►► **Go to step 5**

▼ Continued on next page ▼

▼ ENG OIL PRESS L, R continued ▼

5 Choose one:

◆ Landing using flaps **20**:

Tuning and control panel
GPWS key Push

GPWS FLAP OVRD
line select key OVRD

Note: Use flaps 20 and VREF 20 for landing and flaps 5 for go-around.

▶▶ Go to step 6

◆ Landing using flaps **30 (if performance allows)**:

Note: Use flaps 30 and VREF 30 for landing and flaps 20 for go-around.



6 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake ____
- | Landing data **VREF 20, Minimums** ____
- Approach briefing Completed

▼ Continued on next page ▼

Approach Checklist

Altimeters _____

Landing Checklist

Speedbrake ARMED

Landing gear DOWN

Flaps. **20** |



[] ENG OIL TEMP L, R

[Option – GE engines]

Condition: The engine oil temperature is high.

- 1 A/T ARM switch
(affected side) Confirm OFF
- 2 Thrust lever
(affected side) Confirm Retard
slowly until the
oil temperature is below the
amber band or the thrust lever is at idle

3 Choose one:

- ◆ Oil temperature is **below** the red line limit, or is in the amber band for **less than** 15 minutes:

Note: Run the affected engine at a thrust setting that keeps the oil temperature below the amber band.

Do **not** accomplish the following checklist:

AUTOTHROTTLE



- ◆ Oil temperature is **at or above** the red line limit, or is in the amber band for 15 minutes **or more**:

►► **Go to step 4**

- 4 FUEL CONTROL switch
(affected side) Confirm CUTOFF
- 5 APU selector
(if APU available) START, then ON

▼ Continued on next page ▼

▼ ENG OIL TEMP L, R continued ▼

- 6 TRANSPONDER MODE selector TA ONLY
- 7 Plan to land at the nearest suitable airport.
- 8 Do **not** accomplish the following checklist:
AUTOTHROTTLE

- 9 Choose one:

◆ Landing using flaps **20**:

Tuning and control panel
GPWS key Push
GPWS FLAP OVRD
line select key OVRD

Note: Use flaps 20 and VREF 20 for landing
and flaps 5 for go-around.

▶▶ Go to step 10

◆ Landing using flaps **30 (if performance allows)**:

Note: Use flaps 30 and VREF 30 for landing
and flaps 20 for go-around.



10 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked

▼ Continued on next page ▼

▼ ENG OIL TEMP L, R continued ▼

- Notes. Checked
- Autobrake ____
- | Landing data **VREF 20, Minimums** ____
- Approach briefing Completed

Approach Checklist

- Altimeters ____

Landing Checklist

- Speedbrake ARMED
- Landing gear DOWN
- | Flaps **.20**



[] ENG OIL TEMP L, R

[Option – RR engines]

Condition: The engine oil temperature is high.

- 1 A/T ARM switch
(affected side) Confirm OFF
- 2 Thrust lever
(affected side) Confirm. Retard
slowly until the
oil temperature is below the
red line or the thrust lever is at idle

3 Choose one:

◆ Oil temperature is **below the red line limit**:

Note: Run the engine at a thrust setting that keeps the oil temperature below the red line limit.

Do **not** accomplish the following checklist:

AUTOTHROTTLE



◆ Oil temperature is **at or above** the red line limit:

►► **Go to step 4**

- 4 FUEL CONTROL switch
(affected side) Confirm CUTOFF
- 5 APU selector
(if APU available) START, then ON
- 6 TRANSPONDER MODE selector TA ONLY

▼ Continued on next page ▼

▼ ENG OIL TEMP L, R continued ▼

7 Plan to land at the nearest suitable airport.

8 Do **not** accomplish the following checklist:

AUTOTHROTTLE

9 Choose one:

◆ Landing using flaps **20**:

Tuning and control panel

GPWS key Push

GPWS FLAP OVRD

line select key OVRD

Note: Use flaps 20 and VREF 20 for landing and flaps 5 for go-around.

►► **Go to step 10**

◆ Landing using flaps **30 (if performance allows)**:

Note: Use flaps 30 and VREF 30 for landing and flaps 20 for go-around.



10 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked

Notes. Checked

▼ Continued on next page ▼

▼ **ENG OIL TEMP L, R continued** ▼

Autobrake _____
 Landing data **VREF 20, Minimums** _____ |
 Approach briefing Completed

Approach Checklist

Altimeters _____

Landing Checklist

Speedbrake ARMED
 Landing gear DOWN
 Flaps **20** |



[] ENG REV AIR/GND

Condition: The air/ground thrust reverser logic is failed.

Note: Thrust reverser in-flight protection is failed.
 Reversers will deploy in flight if commanded.



ENG REV COMMANDED L, R

Condition: The affected reverse thrust lever is not in the down position in flight.



[] ENG REV LIMITED L, R

Condition: Affected engine reverser operation is limited.

Note: The affected thrust reverser will not deploy or affected reverse thrust will be limited to idle on landing.

**ENG REVERSER L, R**

Condition: A fault occurs in the thrust reverser system.

**ENG RPM LIMITED L, R**

[Option – GE engines]

Condition: Engine control is limiting affected engine thrust to prevent N2 from exceeding the RPM operating limit.

[Option – RR engines]

Condition: Engine control is limiting affected engine thrust to prevent N1, N2, or N3 from exceeding the RPM operating limit.



[] ENG SEC AIR VLV L, R

[Option – RR engines]

Condition: The engine secondary air system valve is failed in the open position.

- 1 A/T ARM switch
(affected side) Confirm OFF

Note: Control the affected engine thrust manually. Do not exceed the reduced thrust limit for the rest of the flight. The thrust limit may change during flight.

- 2 Do **not** accomplish the following checklist:

AUTOTHROTTLE

**ENG SHUTDOWN**

Condition: Both engines were shut down by the fuel control switches or the engine fire switches.

**ENG SHUTDOWN L, R**

Condition: The affected engine was shut down by the fuel control switch or the engine fire switch.



[] ENG START CUTOUT L, R

Condition: The affected start selector stays in START when commanded to NORM.

- 1 START selector (affected side) NORM

**[] ENG STARTERS L, R**

Condition: Both starters on the affected engine are inoperative.

- 1 Choose one:

◆ On the **ground**:

FUEL CONTROL switch
(affected side) CUTOFF

START selector (affected side) NORM

Do **not** accomplish the following checklist:

ENG AUTOSTART



◆ In **flight**:

START selector (affected side) NORM

Increase airspeed until X-START blanks.



ENG TBV OPEN L, R

[Option – GE engines]

Condition: The engine transient bleed valve is failed in the open position.

**ENG THRUST L, R**

Condition: One of these occurs on the affected engine:

- The thrust is more than the commanded thrust
- The thrust is less than the commanded thrust



[] ENG THRUST HIGH L, R

[Option – RR engines]

Condition: The engine thrust limit is decreased and the commanded thrust exceeds the limit.

- 1 A/T ARM switch
(affected side) Confirm OFF
- 2 Thrust lever (affected side) Retard until
ENG THRUST HIGH
message blanks

Note: Control the affected engine thrust manually. Do not exceed the reduced thrust limit for the rest of the flight. The thrust limit may change during the flight.

- 3 Do **not** accomplish the following checklists:

AUTOTHROTTLE

ENG SEC AIR VLV

**[] THRUST ASYM PROT**

Condition: Thrust asymmetry protection is inoperative.

- 1 At low airspeed, thrust asymmetry protection limits the thrust of the running engine when the other engine is failed.

Note: Maintain airspeed at or above 130 knots.



Volcanic Ash

[Option – RR engines]

Condition: Volcanic ash is suspected when one or more of these occur:

- A static discharge around the windshield
- A bright glow in the engine inlets
- Smoke or dust on the flight deck
- An acrid odor

Objective: To exit the ash cloud and restart engines if needed.

- 1 Exit volcanic ash as quickly as possible. Consider a 180 degree turn.
- 2 Don the oxygen masks and smoke goggles, if needed.
- 3 Establish crew communications, if needed.
- 4 Autothrottle disconnect switch Push

If conditions allow, run the engines at idle.

- 5  Thrust levers (both). Idle

This reduces possible engine damage or flameout, or both, by decreasing EGT.

- 6 ENGINE ANTI-ICE selectors (both). ON

▼ Continued on next page ▼

▼ Volcanic Ash continued ▼

7 APU selector
(if APU available) START, then ON

Note: Volcanic ash can cause non-normal system reactions such as:

- Engine malfunctions, increasing EGT, engine stall, or flameout
- Decrease or loss of airspeed indications
- EQUIP CLG OVRD message
- EQUIP COOLING FWD or AFT message
- FIRE CARGO FWD or AFT message

▼ Continued on next page ▼

▼ Volcanic Ash continued ▼

8 Choose one:

- ◆ Engines are flamed out or stalled, or EGT is rapidly approaching or exceeding the limit:

FUEL CONTROL switches

(both) CUTOFF, then RUN

RAM AIR TURBINE

switch Push and hold
for 1 second

Set airspeed **above 250 knots**.

The engines may accelerate to idle very slowly, especially at high altitudes.

Slow acceleration may be incorrectly interpreted as a hung start or engine malfunction. If N2 is steadily increasing and EGT stays within limits, the start is progressing normally. Any further cycling of the fuel control switches will result in longer start times.

►► **Go to step 9**

- ◆ Engines are running **normally**:

►► **Go to step 9**

9 Plan to land at the nearest suitable airport.

10 Do **not** accomplish the following checklists:

EQUIP CLG OVRD AFT

EQUIP CLG OVRD FWD



Volcanic Ash

[Option – GE engines]

Condition: Volcanic ash is suspected when one or more of these occur:

- A static discharge around the windshield
- A bright glow in the engine inlets
- Smoke or dust on the flight deck
- An acrid odor

Objective: To exit the ash cloud and restart engines if needed.

- 1 Exit volcanic ash as quickly as possible. Consider a 180 degree turn.
- 2 Don the oxygen masks and smoke goggles, if needed.
- 3 Establish crew communications, if needed.
- 4 Autothrottle disconnect switch Push
- 5  **If conditions allow, run the engines at idle.**
Thrust levers (both) Idle
This reduces possible engine damage or flameout, or both, by decreasing EGT.
- 6 ENGINE ANTI-ICE selectors (both) ON

Continued on next page

▼ Volcanic Ash continued ▼

- 7 APU selector
(if APU available) START, then ON

Note: Volcanic ash can cause non-normal system reactions such as:

- Engine malfunctions, increasing EGT, engine stall, or flameout
- Decrease or loss of airspeed indications
- EQUIP CLG OVRD message
- EQUIP COOLING FWD or AFT message
- FIRE CARGO FWD or AFT message

▼ Continued on next page ▼

▼ Volcanic Ash continued ▼

8 Choose one:

- ◆ Engines are flamed out or stalled, or EGT is rapidly approaching or exceeding the limit:

FUEL CONTROL switches
(both) CUTOFF, then RUN
RAM AIR TURBINE
switch Push and hold
for 1 second

Set airspeed **above 270 knots**.

The engines may accelerate to idle very slowly, especially at high altitudes.

The time from fuel control switch to RUN to stable idle may be as long as two and a half minutes. Slow acceleration may be incorrectly interpreted as a hung start or engine malfunction. If N2 is steadily increasing and EGT stays within limits, the start is progressing normally.

►► **Go to step 9**

- ◆ Engines are running **normally**:

►► **Go to step 9**

9 Plan to land at the nearest suitable airport.

10 Do **not** accomplish the following checklists:

EQUIP CLG OVRD AFT

EQUIP CLG OVRD FWD



Non-Normal Checklists

Chapter NNC

Fire Protection

Section 8

Table of Contents

FIRE APU	8.1
FIRE ENG L, R	8.2
Fire Eng Tailpipe L, R	8.5
Smoke, Fire or Fumes	8.6

BOTTLE 1, 2 DISCH ENG	8.10
BOTTLE DISCH APU	8.10
BOTTLE DISCH CARGO	8.11
DET FIRE APU	8.11
DET FIRE CARGO AFT, FWD	8.11
DET FIRE ENG L, R	8.12
FIRE APU	8.1
FIRE CARGO AFT	8.14
FIRE CARGO FWD	8.16
FIRE ENG L, R	8.2
Fire Eng Tailpipe L, R	8.5
FIRE WHEEL WELL	8.18
OVERHEAT ENG L, R	8.20
OVERHEAT WHEEL WELL	8.23
SMOKE EQUIP CLG AFT	8.24
SMOKE EQUIP CLG FWD	8.26
SMOKE EQUIP CLG MISC	8.28
Smoke or Fumes Removal	8.30
SMOKE LAVATORY	8.31
SMOKE REST UPR DR 1	8.32
SMOKE REST UPR DR 4	8.33

Table of Contents

Smoke, Fire or Fumes 8.6

[] FIRE APU

Condition: Fire is detected in the APU.

- 1 APU fire
switch Confirm Pull, rotate
to the stop and
hold for 1 second

- 2 Choose one:

◆ FIRE APU message **stays shown**:

Plan to land at the nearest suitable airport.

Do **not** accomplish the following checklist:

APU SHUTDOWN



◆ FIRE APU message **blanks**:

Do **not** accomplish the following checklist:

APU SHUTDOWN



[] FIRE ENG L, R

Condition: Fire is detected in the engine.

- 1 A/T ARM switch
(affected side) Confirm OFF
- 2 Thrust lever
(affected side) Confirm Idle
- 3 FUEL CONTROL
switch (affected side) Confirm . . . CUTOFF
- 4 Engine fire switch
(affected side) Confirm Pull
- 5 **If** the FIRE ENG message stays shown:

Engine fire switch
(affected side) Rotate to the stop
and hold for 1 second

If after 30 seconds, the FIRE ENG message
stays shown:

Engine fire switch
(affected side) Rotate to the
other stop and
hold for 1 second

-
- 6 APU selector
(if APU available) START, then ON
 - 7 TRANSPONDER MODE selector TA ONLY
 - 8 Plan to land at the nearest suitable airport.
 - 9 Do **not** accomplish the following checklists:

AUTOTHROTTLE

▼ Continued on next page ▼

▼ FIRE ENG L, R continued ▼

OVERHEAT ENG

10 Choose one:

◆ Landing using flaps **20**:

Tuning and control panel
 GPWS key. Push
 GPWS FLAP OVRD
 line select key OVRD

Note: Use flaps 20 and VREF 20 for landing
 and flaps 5 for go-around.

▶▶ **Go to step 11**◆ Landing using flaps **30 (if performance allows)**:

Note: Use flaps 30 and VREF 30 for landing
 and flaps 20 for go-around.



11 Checklist Complete Except Deferred Items

▼ Continued on next page ▼

▼ FIRE ENG L, R continued ▼

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake ____
- | Landing data **VREF 20, Minimums** ____
- Approach briefing Completed

Approach Checklist

- Altimeters ____

Landing Checklist

- Speedbrake ARMED
- Landing gear DOWN
- | Flaps **20**



Fire Eng Tailpipe L, R

Condition: An affected engine tailpipe fire occurs on the ground with no engine fire warning.

- 1 FUEL CONTROL switch
(affected side) CUTOFF
- 2 Engine fire switch
(affected side) Verify In
- 3 Advise the cabin.
- 4 START selector (affected side) START
This motors the engine if the APU or 2 external
power sources are on.
- 5 Advise the tower.
- 6 **When** the tailpipe fire is extinguished:
START selector (affected side) NORM
■ ■ ■ ■

Smoke, Fire or Fumes

Condition: Smoke, fire, or fumes occur.

Objective: To remove power from the ignition source.
To land the airplane as soon as possible, if needed.

- 1 Diversion may be needed.
- 2 Don the oxygen masks and smoke goggles, if needed.
- 3 Establish crew and cabin communications.
- 4 IFE/PASS SEATS power switch Off
- 5 RECIRC FANS switches (both) Off
- 6 Any time the smoke or fumes become the greatest threat:

►► **Go to the Smoke or Fumes Removal checklist on page 8.30**

▼ Continued on next page ▼

▼ Smoke, Fire or Fumes continued ▼

7 Choose one:

- ◆ Source of the smoke, fire, or fumes **is** obvious **and can** be extinguished quickly:

Isolate and extinguish the source of the smoke, fire, or fumes.

If practical, remove power from the affected equipment by switch or circuit breaker in the flight deck or cabin.

▶▶ **Go to step 8**

- ◆ Source of the smoke, fire, or fumes is **not** obvious **or cannot** be extinguished quickly:

▶▶ **Go to step 9**

8 Choose one:

- ◆ Source **is** visually confirmed to be extinguished **and** smoke or fumes are **decreasing**:

Continue the flight at the captain's discretion.

Restore unpowered items at the captain's discretion.

▶▶ **Go to the Smoke or Fumes Removal checklist on page 8.30, if needed**



- ◆ Smoke or fumes **continue**:

▶▶ **Go to step 9**

▼ Continued on next page ▼

▼ Smoke, Fire or Fumes continued ▼

- 9 Advise the cabin that the main cabin lighting will be turned off.
- 10 CABIN/UTILITY power switch Off
- 11 Start a diversion to the nearest suitable airport while continuing the checklist.
- 12 Consider an immediate landing if the smoke, fire, or fumes situation becomes uncontrollable.
- 13 Do not delay landing in an attempt to complete the following steps.
- 14 L PACK switch Off
- 15 L TRIM AIR switch Off
- 16 **Wait** 2 minutes unless the smoke or fumes are increasing.
- 17 Do **not** accomplish the following checklists:
 - PACK L
 - TRIM AIR L

▼ Continued on next page ▼

▼ Smoke, Fire or Fumes continued ▼

18 Choose one:

◆ Smoke or fumes **continue**:

L PACK switch AUTO

L TRIM AIR switch ON

R PACK switch Off

R TRIM AIR switch Off

►► **Go to step 19**

◆ Smoke or fumes are **decreasing**:

►► **Go to the Smoke or Fumes Removal
checklist on page 8.30, if needed**



19 **Wait** 2 minutes unless the smoke or fumes are increasing.

20 Do **not** accomplish the following checklists:

PACK R

TRIM AIR R

▼ Continued on next page ▼

▼ **Smoke, Fire or Fumes continued** ▼

21 Choose one:

◆ Smoke or fumes **continue**:

R PACK switch AUTO

R TRIM AIR switch ON

Consider an immediate landing.

▶▶ **Go to the Smoke or Fumes Removal
checklist on page 8.30, if needed**◆ Smoke or fumes are **decreasing**:▶▶ **Go to the Smoke or Fumes Removal
checklist on page 8.30, if needed****BOTTLE 1, 2 DISCH ENG**Condition: The engine fire extinguisher bottle pressure
is low.**BOTTLE DISCH APU**Condition: The APU fire extinguisher bottle pressure is
low.

BOTTLE DISCH CARGO

Condition: Both rapid discharge cargo fire extinguisher bottle pressures are low.

**[] DET FIRE APU**

Condition: APU fire detection is failed.

1 Choose one:

◆ APU **is** running:

Plan to shut down the APU as soon as practical.



◆ APU is **not** running:

Note: Do not start the APU unless use is needed.

**DET FIRE CARGO AFT, FWD**

Condition: Cargo compartment smoke detection is failed.



[] DET FIRE ENG L, R

Condition: An affected engine fire detection system fault occurs.

Note: Engine fire detection may not be available.
An engine fire warning that occurs is valid.



Intentionally
Blank

[] FIRE CARGO AFT

Condition: Smoke is detected in the aft cargo compartment.

- 1 AFT CARGO FIRE
ARM switch Confirm ARMED
- 2 CARGO FIRE DISCH switch Push and hold
for 1 second
- 3 LDG ALT selector PULL ON, set 8000
This minimizes extinguisher agent leakage out
of the compartment.

- 4 Plan to land at the nearest suitable airport.

Note: Aft equipment cooling normal mode is inoperative. After 30 minutes of operation at low altitude and low cabin differential pressure, non-critical electronic equipment may fail.

- 5 **When** at top of descent:
LDG ALT selector Push off
- 6 Do **not** accomplish the following checklists:
EQUIP CLG OVRD AFT
LANDING ALTITUDE
SMOKE EQUIP CLG AFT

7 Checklist Complete Except Deferred Items

▼ Continued on next page ▼

▼ FIRE CARGO AFT continued ▼

Deferred Items**Descent Checklist**

Recall Checked

Notes Checked

Autobrake ____

Landing data VREF____, Minimums____

Approach briefing Completed

Approach Checklist

Altimeters ____

Warning! Inform ground personnel NOT to open any cargo door after landing until all passengers and crew have exited the airplane and fire fighting equipment is nearby.

Landing Checklist

Speedbrake ARMED

Landing gear DOWN

Flaps ____



[] FIRE CARGO FWD

Condition: Smoke is detected in the forward cargo compartment.

- 1 FWD CARGO FIRE
ARM switch Confirm ARMED
- 2 CARGO FIRE DISCH switch Push and hold
for 1 second
- 3 LDG ALT selector PULL ON, set 8000
This minimizes extinguisher agent leakage out
of the compartment.
- 4 Plan to land at the nearest suitable airport.

Note: Forward equipment cooling normal mode is inoperative. After 30 minutes of operation at low altitude and low cabin differential pressure, non-critical electronic equipment may fail.

- 5 **When** at top of descent:
LDG ALT selector Push off
- 6 Do **not** accomplish the following checklists:
CARGO HEAT FWD
EQUIP CLG OVRD FWD
LANDING ALTITUDE
SMOKE EQUIP CLG FWD

▼ Continued on next page ▼

▼ FIRE CARGO FWD continued ▼

Deferred Items**Descent Checklist**

Recall Checked

Notes Checked

Autobrake ____

Landing data VREF____, Minimums____

Approach briefing Completed

Approach Checklist

Altimeters ____

Warning! Inform ground personnel NOT to open any cargo door after landing until all passengers and crew have exited the airplane and fire fighting equipment is nearby.

Landing Checklist

Speedbrake ARMED

Landing gear DOWN

Flaps ____



[] FIRE WHEEL WELL

Condition: Fire is detected in a main wheel well.

- 1 Do not exceed the gear EXTEND limit speed (270 K/.82M).
- 2 Landing gear leverDN
This attempts to remove and extinguish the fire source.
- 3 ALTN GEAR
extend switch.Push to DOWN
and hold for 15 seconds
- 4 Plan to land at the nearest suitable airport.
- 5 Flight with the gear down increases fuel consumption and decreases climb performance. Refer to the Gear Down performance tables in the Performance Inflight chapter for flight planning.
- 6 Choose one:
 - ◆ Gear **does not need to be retracted** for airplane performance:

■ ■ ■ ■
 - ◆ Gear **must be retracted** for airplane performance:
- 7 **When** the FIRE WHEEL WELL message blanks:
Wait 20 minutes. This ensures the fire is extinguished.

▼ Continued on next page ▼

▼ FIRE WHEEL WELL continued ▼

Landing gear lever UP

8 Do **not** accomplish the following checklists:

OVERHEAT WHEEL WELL

GEAR DOOR



[] OVERHEAT ENG L, R

Condition: An overheat is detected in the engine.

- 1 ENGINE ANTI-ICE selector
(affected side) OFF
- 2 A/T ARM switch
(affected side) Confirm OFF
- 3 Thrust lever
(affected side) . . . Confirm . . . Retard slowly until
the OVERHEAT ENG
message blanks or the
thrust lever is at idle
- 4 Choose one:
 - ◆ OVERHEAT ENG message **blanks**:

Note: Run the affected engine at a thrust setting that keeps the OVERHEAT ENG message blank.

►► **Go to step 9**
 - ◆ OVERHEAT ENG message **stays shown**:

►► **Go to step 5**
- 5 FUEL CONTROL switch
(affected side) Confirm . . . CUTOFF
- 6 APU selector (if APU available) . . . START, then ON
- 7 TRANSPONDER MODE selector TA ONLY
- 8 Plan to land at the nearest suitable airport.

▼ Continued on next page ▼

▼ OVERHEAT ENG L, R continued ▼

9 Do **not** accomplish the following checklist:

AUTOTHROTTLE

10 Choose one:

◆ Landing using flaps **20**:

Tuning and control panel
GPWS key. Push

GPWS FLAP OVRD
line select key OVRD

Note: Use flaps 20 and VREF 20 for
landing and flaps 5 for go-around.

►► **Go to step 11**

◆ Landing using flaps **30 (if performance allows)**:

Note: Use flaps 30 and VREF 30 for
landing and flaps 20 for go-around.



11 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ OVERHEAT ENG L, R continued ▼

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake ____
- | Landing data **VREF 20, Minimums** ____
- Approach briefing Completed

Approach Checklist

- Altimeters ____

Landing Checklist

- Speedbrake ARMED
- Landing gear DOWN
- | Flaps **20**



[] OVERHEAT WHEEL WELL

Condition: An overheat is detected in either the left or right wheel well.

Objective: To cool off hot brakes.

- 1 Do not exceed the landing gear EXTEND limit speed (270K/.82M).
- 2 Landing gear lever DN
- 3 **When** the OVERHEAT WHEEL WELL message blanks:

Wait 8 minutes.

Landing gear lever UP

Continue normal operation.



[] SMOKE EQUIP CLG AFT

Condition: Smoke is detected in the aft equipment cooling system.

Objective: To reset the aft equipment cooling system and determine if a divert is needed.

- 1 **Wait** 2 minutes. This allows time for any smoke in the system to clear.
- 2 EQUIP COOLING AFT switch. . . . Off, then AUTO
- 3 Do **not** accomplish the following checklist:
EQUIP CLG OVRD AFT

- 4 Choose one:

◆ SMOKE EQUIP CLG AFT message **stays shown**:

Plan to land at the nearest suitable airport.

Note: After 30 minutes of operation at low altitude and low cabin differential pressure, non-critical electronic equipment may fail.



◆ SMOKE EQUIP CLG AFT message **blanks**:



Intentionally
Blank

[] SMOKE EQUIP CLG FWD

Condition: Smoke is detected in the forward equipment cooling system.

Objective: To reset the forward equipment cooling system and determine if a divert is needed.

- 1 **Wait** 2 minutes. This allows time for any smoke in the system to clear.
- 2 EQUIP COOLING FWD switch Off, then AUTO
- 3 **Wait** 30 seconds. This allows time for any smoke in the system to clear.
- 4 Do **not** accomplish the following checklist:
EQUIP CLG OVRD FWD

▼ Continued on next page ▼

▼ SMOKE EQUIP CLG FWD continued ▼

5 Choose one:

◆ SMOKE EQUIP CLG FWD message **stays shown**:

Plan to land at the nearest suitable airport.

Note: After 30 minutes of operation at low altitude and low cabin differential pressure, non-critical electronic equipment may fail.

The forward cargo heat is inoperative. The temperature in the forward cargo compartment will stay above freezing.

Do **not** accomplish the following checklist:

CARGO HEAT FWD



◆ SMOKE EQUIP CLG FWD message **blanks**:



[] SMOKE EQUIP CLG MISC

Condition: Smoke is detected in the miscellaneous equipment cooling system.

Note: All power is removed from the affected equipment for the rest of the flight. IFE is inoperative.

1 **Wait** 6 minutes.

2 Choose one:

◆ SMOKE EQUIP CLG MISC message **stays shown:**

Plan to land at the nearest suitable airport.

Note: Miscellaneous cooling smoke detection is no longer reliable.



◆ SMOKE EQUIP CLG MISC message **blanks:**



Intentionally
Blank

Smoke or Fumes Removal

Condition: Smoke or fumes removal is needed.

- 1 Do this checklist only when directed by the Smoke, Fire or Fumes checklist.
 - 2 Do not delay landing in an attempt to complete the following steps.
 - 3 Close the flight deck door.
 - 4 Choose one:
 - ◆ Most smoke or fumes are in the cabin **forward** of mid-wing:
 - ▶▶ **Go to step 5**
 - ◆ Most smoke or fumes are in the cabin **aft** of mid-wing:
 - ▶▶ **Go to step 9**
 - 5 EQUIP COOLING FWD switch Off
- Note:** After 30 minutes of operation at low altitude and low cabin differential pressure, non-critical electronic equipment may fail.
- 6 AFT OUTFLOW VALVE switch MAN
 - 7 AFT OUTFLOW VALVE
MANUAL switch Push to CLOSE and
hold until the outflow
valve indication shows fully closed
 - 8 Do **not** accomplish the following checklists:
EQUIP CLG OVRD FWD

▼ Continued on next page ▼

▼ Smoke or Fumes Removal continued ▼

OUTFLOW VALVE AFT

- **Go to the Smoke, Fire or Fumes checklist on page 8.6, and do the remaining steps**



9 EQUIP COOLING AFT switch. Off

Note: After 30 minutes of operation at low altitude and low cabin differential pressure, non-critical electronic equipment may fail.

10 FWD OUTFLOW VALVE switch. MAN

11 FWD OUTFLOW

VALVE MANUAL switch Push to CLOSE and
hold until the outflow
valve indication shows fully closed

12 Do **not** accomplish the following checklists:

CARGO HEAT FWD

EQUIP CLG OVRD AFT

OUTFLOW VALVE FWD

- **Go to the Smoke, Fire or Fumes checklist on page 8.6, and do the rest of the steps**



SMOKE LAVATORY

Condition: Smoke is detected in one or more lavatories.



[] SMOKE REST UPR DR 1

[Option – Door 1 crew rest area]

Condition: Smoke is detected in the Overhead Flight Crew Rest area.

Objective: To coordinate with the cabin to locate and remove the source of the smoke.

1 Establish cabin communications.

2 Choose one:

◆ Smoke is **persistent**:

Plan to land at the nearest suitable airport.



◆ Smoke has **cleared**:



[] SMOKE REST UPR DR 4

[Option – Door 4 crew rest area]

Condition: Smoke is detected in the Overhead Flight Attendant Rest area.

Objective: To coordinate with the cabin to locate and remove the source of the smoke.

1 Establish cabin communications.

2 Choose one:

◆ Smoke is **persistent**:

Plan to land at the nearest suitable airport.



◆ Smoke has **cleared**:



Intentionally
Blank

Table of Contents

STABILIZER	9.1

AUTO SPEEDBRAKE	9.3
CRUISE FLAPS SYS.....	9.4
FLAPS DRIVE	9.6
FLAPS PRIMARY FAIL	9.8
FLAP/SLAT CONTROL	9.10
FLIGHT CONTROL MODE	9.12
FLIGHT CONTROLS.....	9.16
FLT CONTROLS LOCKED.....	9.17
Jammed Flight Controls.....	9.18
PITCH DOWN AUTHORITY	9.19
PITCH UP AUTHORITY	9.20
PRI FLIGHT COMPUTERS	9.22
ROLL LEFT AUTHORITY	9.26
ROLL RIGHT AUTHORITY	9.28
ROLL/YAW ASYMMETRY	9.29
SLATS DRIVE.....	9.30
SLATS PRIMARY FAIL.....	9.31
SPEEDBRAKE EXTENDED	9.31
SPOILER DRAG	9.32
SPOILER PAIRS.....	9.32
SPOILERS	9.33
STAB GREENBAND	9.34
STABILIZER	9.1
STABILIZER CUTOUT	9.35

Table of Contents

STABILIZER L29.35

STABILIZER R29.35

STALL PROTECTION.....9.36

[] STABILIZER

Condition: One of these occurs:

- Stabilizer movement without a signal to trim
- The stabilizer is failed

1 STAB cutout switches (both) CUTOUT

2 Do not exceed the current airspeed.

3 The stabilizer is inoperative. Pitch trim is available in the normal flight control mode.

4 Tuning and control panel GPWS key Push

5 GPWS FLAP OVRD line select key OVRD

Note: Use flaps 20 and VREF 30 + 20 for landing. This gives sufficient elevator authority for landing.

6 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ STABILIZER continued ▼

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake ____
- Landing dataVREF 30 + 20, Minimums____
- Approach briefing Completed

Approach Checklist

- Altimeters ____

Landing Checklist

- Speedbrake ARMED
- Landing gear DOWN
- Flaps20



[] AUTO SPEEDBRAKE

Condition: An automatic speedbrake fault occurs.

Note: Do not arm the speedbrake lever. This prevents inadvertent in-flight speedbrake extension.

Manually extend the speedbrakes after landing.

1 Checklist Complete Except Deferred Items**Deferred Items****Descent Checklist**

Recall Checked
 Notes Checked
 Autobrake ____
 Landing data VREF ____, Minimums ____
 Approach briefing Completed

Approach Checklist

Altimeters ____

Landing Checklist

Speedbrake **DOWN**
 Landing gear DOWN
 Flaps ____



[] CRUISE FLAPS SYS

Condition: The cruise flaps system is not in the correct position.

Note: Do not use FMC fuel predictions.

Drag due to incorrect cruise flap position may decrease range.

Use normal flaps for landing.



Intentionally
Blank

[] FLAPS DRIVE

Condition: The flap drive mechanism is failed.

- 1 Do not use alternate flaps. Asymmetry and uncommanded motion protection is not provided in the alternate mode.
- 2 Tuning and control panel GPWS key Push
- 3 GPWS FLAP OVRD line select key OVRD

Note: Do not use FMC fuel predictions with flaps extended.

- 4 Choose one:

◆ Flap position is **5 or less**:

Note: Move the flap lever to 1 and use VREF 30 + 40 for landing. This ensures the slats are extended.

►► **Go to step 5**

◆ Flap position is **between 5 and 20**:

Note: Use current flaps and VREF 30 + 20 for landing.

►► **Go to step 5**

◆ Flap position is **20 or greater**:

Note: Use current flaps and VREF 20 for landing.

►► **Go to step 5**

▼ **Continued on next page** ▼

▼ **FLAPS DRIVE continued** ▼

5 Do **not** accomplish the following checklist:

FLAPS PRIMARY FAIL

6 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Recall Checked
Notes Checked
Autobrake ____
Landing data **VREF** __, **Minimums**__
Approach briefing Completed

Approach Checklist

Altimeters ____

Landing Checklist

Speedbrake ARMED
Landing gear DOWN
Flaps. ____



[] FLAPS PRIMARY FAIL

Condition: The flaps primary mode is failed.

- 1 Tuning and control panel GPWS key Push
- 2 GPWS FLAP OVRD line select key OVRD

Note: Plan more time for slower flap operation.
Use flaps 20 and VREF 20 for landing. This provides improved go-around performance.

3 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake _____
- Landing data **VREF 20, Minimums** _____
- Approach briefing Completed

Approach Checklist

- Altimeters _____

Landing Checklist

- Speedbrake ARMED
- Landing gear DOWN
- Flaps **20**



Intentionally
Blank

[] FLAP/SLAT CONTROL

Condition: The flap/slat electronics units are failed.

1 **If** flap retraction is needed:

FLAP lever UP

This allows the maximum speed indication on the PFD to increase to Vmo/Mmo.

ALTN FLAPS ARM switch ALTN

Alternate flaps selector RET

Monitor airspeed during retraction.

2 Tuning and control panel GPWS key Push

3 GPWS FLAP OVRD line select key OVRD

Note: Plan more time for alternate flap and slat extension.

Use flaps 20 and VREF 20 for landing. The alternate mode is limited to a maximum of flaps 20.

4 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ FLAP/SLAT CONTROL continued ▼

Deferred Items**Descent Checklist**

Recall Checked

Notes Checked

Autobrake ____

Landing data **VREF 20, Minimums** ____

Approach briefing Completed

Approach Checklist

Altimeters ____

Alternate flaps extension

ALTN FLAPS ARM switch. ALTN

Alternate flaps selector EXT

Monitor airspeed during extension.

Landing Checklist

Speedbrake ARMED

Landing gear DOWN

Flaps. **20**



[] FLIGHT CONTROL MODE

Condition: The flight control system is in the secondary mode.

- 1 PRIMARY FLIGHT COMPUTERS disconnect switch DISC, then AUTO
- 2 Choose one:
 - ◆ FLIGHT CONTROL MODE message **blanks**:
 ■ ■ ■ ■
 - ◆ FLIGHT CONTROL MODE message **stays shown**:
 ▶▶ **Go to step 3**

Note: Maintain airspeed at or above 130 knots.

- 3 Avoid abrupt control inputs. The airplane response is changed by simplified elevator feel and rudder ratio systems.
- 4 Tuning and control panel GPWS key Push
- 5 GPWS FLAP OVRD line select key OVRD

Note: Inoperative Items
Autopilot inop
Envelope protection functions inop
Thrust asymmetry protection inop
▼ Continued on next page ▼

▼ **FLIGHT CONTROL MODE continued** ▼

Note: The yaw damper is degraded.

Manual control inputs are needed to compensate for asymmetrical thrust conditions.

Use flaps 20 and VREF 20 for landing. If VREF 20 is less than 130 knots, use 130 knots for VREF. This ensures sufficient pitch trim and directional control capability for landing.

Do not arm the speedbrake lever. This prevents inadvertent in-flight speedbrake extension.

Manually extend the speedbrakes after landing.

6 Do **not** accomplish the following checklists:

THRUST ASYM PROT

AUTO SPEEDBRAKE

7 **Checklist Complete Except Deferred Items**

▼ **Continued on next page** ▼

▼ FLIGHT CONTROL MODE continued ▼

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake ____
- Landing data **VREF 20, Minimums** ____
- Approach briefing Completed

Approach Checklist

- Altimeters ____

Landing Checklist

- Speedbrake **DOWN**
- Landing gear DOWN
- Flaps **.20**



Intentionally
Blank

[] FLIGHT CONTROLS

Condition: One or more of these occur:

- Two or more flight control surfaces are inoperative
- Other faults in the flight control system are detected

- 1 Handling qualities are degraded. Pitch and roll control capability is reduced with fewer operating control surfaces.
- 2 Plan to land at the nearest suitable airport.
- 3 Tuning and control panel GPWS key Push
- 4 GPWS FLAP OVRD line select key OVRD

Note: Use flaps 20 and VREF 30 + 20 for landing. Higher approach speeds improve airplane maneuvering characteristics.

Crosswind limit for landing is 20 knots.

Roll rate may be reduced in flight.
Speedbrake effectiveness may be reduced in flight and during landing.

Do not move the flap lever after landing. This prevents uncommanded movement.

5 Checklist Complete Except Deferred Items

▼ Continued on next page ▼

▼ **FLIGHT CONTROLS continued** ▼

Deferred Items

Descent Checklist

Recall Checked
 Notes Checked
 Autobrake ____
 Landing data **VREF 30 + 20, Minimums** ____
 Approach briefing Completed

Approach Checklist

Altimeters ____

Landing Checklist

Speedbrake ARMED
 Landing gear DOWN
 Flaps. **20**



FLT CONTROLS LOCKED

Condition: One or both Flight Control Surfaces switches are in the Off position.



Jammed Flight Controls

Condition: Flight controls are jammed or restricted in roll, pitch, or yaw.

- 1 Autopilot disconnect switch Push
- 2 Autothrottle disconnect switch Push
- 3 Overpower the jammed or restricted system.

Use maximum force, including a combined effort of both pilots, as needed. A maximum two-pilot effort on the controls will not damage the flight controls.

- 4 Choose one:

◆ Controls are **normal**:

▶▶ **Go to step 6**

◆ Controls stay **jammed or restricted**:

Note: Use stabilizer or rudder trim to offload control forces.

Do not make abrupt thrust changes.

Extend or retract speedbrake slowly and smoothly.

Limit bank angle to 15 degrees.

▶▶ **Go to step 5**

- 5 If flight controls stay jammed or restricted, autopilot and autothrottle may be used to control the airplane.
- 6 Plan to land at the nearest suitable airport.



[] PITCH DOWN AUTHORITY

Condition: Pitch down authority is restricted.

- 1 Slower airspeeds assist nose down pitch control. The airplane is approaching its nose down pitch control limit.

Note: Avoid speedbrake use and rapid thrust increases. Only limited elevator authority is available to counter nose up pitching.



[] PITCH UP AUTHORITY

Condition: Pitch up and flare authority are restricted.

- 1 Do not extend the flaps any further until on approach. The airplane is approaching its nose up pitch control limit.
- 2 Tuning and control panel GPWS key Push
- 3 GPWS FLAP OVRD line select key OVRD

Note: Do not use autoland.

4 Choose one:

◆ Flap position is **15 or less**:

Note: Use flaps 5 and VREF 30 + 40 for landing. Higher approach speeds give better pitch up control authority.



◆ Flap position is **20 or greater**:

Note: Use flaps 20 and VREF 30 + 20 for landing. Higher approach speeds give better pitch up control authority.

5 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake _____

▼ Continued on next page ▼

▼ **PITCH UP AUTHORITY** continued ▼

Landing data **VREF 30 + 40 or**
VREF 30 + 20, Minimums ____

Approach briefing Completed

Approach Checklist

Altimeters ____

Landing Checklist

Speedbrake ARMED

Landing gear DOWN

Flaps. **5 or 20**



[] PRI FLIGHT COMPUTERS

Condition: The flight control system is operating in the direct mode.

- 1 PRIMARY FLIGHT COMPUTERS
disconnect switch DISC, then AUTO
- 2 Choose one:
 - ◆ PRI FLIGHT COMPUTERS message **blanks**:

■ ■ ■ ■
 - ◆ PRI FLIGHT COMPUTERS message stays shown:
- Note:** Maintain airspeed at or above 130 knots.
- Go to step 3**
- 3 Avoid abrupt control inputs. Airplane response is changed by simplified elevator feel and rudder ratio systems.
- 4 Tuning and control panel GPWS key Push
- 5 GPWS FLAP OVRD line select key OVRD

Note: Inoperative Items

Autopilot inop

Envelope protection functions inop

Thrust asymmetry protection inop

▼ Continued on next page ▼

▼ **PRI FLIGHT COMPUTERS continued** ▼

Note: Manual control inputs are needed to compensate for asymmetrical thrust conditions.

Use flaps 20 and VREF 20 for landing. If VREF 20 is less than 130 knots, use 130 knots for VREF. This ensures sufficient pitch trim and directional control capability for landing.

Do not arm the speedbrake lever. This prevents inadvertent in-flight speedbrake extension.

Manually extend the speedbrakes after landing.

6 Do **not** accomplish the following checklists:

THRUST ASYM PROT

AUTO SPEEDBRAKE

7 **Checklist Complete Except Deferred Items**

▼ **Continued on next page** ▼

▼ PRI FLIGHT COMPUTERS continued ▼

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake ____
- Landing data **VREF 20, Minimums** ____
- Approach briefing Completed

Approach Checklist

- Altimeters ____

Landing Checklist

- Speedbrake **DOWN**
- Landing gear DOWN
- Flaps **.20**



Intentionally
Blank

[] ROLL LEFT AUTHORITY

Condition: The pilot has limited roll control to the left because the ailerons or rudder are near full travel.

- 1 The flight control system is compensating for an airplane asymmetry.
- 2 Plan to land at the nearest suitable airport.
- 3 Tuning and control panel GPWS key Push
- 4 GPWS FLAP OVRD line select key OVRD

Note: An unknown drag condition may decrease range.

Use LRC speed for diversion. Do not use FMC fuel predictions.

Use flaps 20 and VREF 30 + 20 for landing. Higher approach speed improves maneuvering characteristics.

The crosswind limit for landing is 10 knots.

Large slip and bank angles may be needed to maintain course on the approach. A left control wheel input may be needed after landing to control roll asymmetry.

5 Checklist Complete Except Deferred Items

▼ Continued on next page ▼

▼ ROLL LEFT AUTHORITY continued ▼

Deferred Items**Descent Checklist**

Recall Checked

Notes Checked

Autobrake ____

Landing data **VREF 30 + 20, Minimums** ____

Approach briefing Completed

Approach Checklist

Altimeters ____

Landing Checklist

Speedbrake ARMED

Landing gear DOWN

Flaps. **20**



[] ROLL RIGHT AUTHORITY

Condition: The pilot has limited roll control to the right because the ailerons or rudder are near full travel.

- 1 The flight control system is compensating for an airplane asymmetry.
- 2 Plan to land at the nearest suitable airport.
- 3 Tuning and control panel GPWS key Push
- 4 GPWS FLAP OVRD line select key OVRD

Note: An unknown drag condition may decrease range.

Use LRC speed for diversion. Do not use FMC fuel predictions.

Use flaps 20 and VREF 30 + 20 for landing. Higher approach speed improves maneuvering characteristics.

The crosswind limit for landing is 10 knots.

Large slip and bank angles may be needed to maintain course on the approach. A right control wheel input may be needed after landing to control roll asymmetry.

5 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked

Notes. Checked

▼ Continued on next page ▼

▼ ROLL RIGHT AUTHORITY continued ▼

Autobrake _____

Landing data **VREF 30 + 20, Minimums** _____

Approach briefing Completed

Approach Checklist

Altimeters _____

Landing Checklist

Speedbrake ARMED

Landing gear DOWN

Flaps. **20****[] ROLL/YAW ASYMMETRY**

Condition: An airplane roll or yaw asymmetry occurs.

- 1 Plan to land at the nearest suitable airport.

Note: An unknown drag condition may decrease range.

Use LRC speed for diversion. Do not use FMC fuel predictions.



[] SLATS DRIVE

Condition: The slat drive mechanism is failed.

- 1 Do not use alternate flaps. Asymmetry and uncommanded motion protection are not provided in the alternate mode.
- 2 Tuning and control panel GPWS key Push
- 3 GPWS FLAP OVRD line select key OVRD

Note: Do not use FMC fuel predictions with slats extended.
Do not use autoland.
Use flaps 20 and VREF 30 + 30 for landing.
This gives better handling qualities when the slats are not fully extended.

4 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake _____
- Landing data **VREF 30 + 30, Minimums** _____
- Approach briefing Completed

Approach Checklist

- Altimeters _____

▼ Continued on next page ▼

▼ SLATS DRIVE continued ▼

Landing Checklist

Speedbrake ARMED
 Landing gear DOWN
 Flaps. **20**

**[] SLATS PRIMARY FAIL**

Condition: The slats primary mode is failed.

Note: Plan more time for slower slat operation.

The slats will extend beyond midrange when the airspeed is below 225 knots. For go-around, do not exceed 225 knots until the slats retract to midrange.

**SPEEDBRAKE EXTENDED**

Condition: The speedbrakes are extended and one or more of these occur:

- The radio altitude is between 15 and 800 feet
- The flap lever is in a landing setting
- A thrust lever is not at idle



[] SPOILER DRAG

Condition: Some spoilers are not stowed because center hydraulic system pressure is low.

Objective: To reduce drag by enabling the center hydraulic system to power and stow two spoiler pairs.

- 1 RAM AIR TURBINE switch Push and hold for 1 second
- 2 Fly LRC speed. This improves range.

**[] SPOILER PAIRS**

Condition: Two spoiler pairs are failed.

Note: Roll rate may be reduced in flight. Speedbrake effectiveness may be reduced in flight and during landing.

Do not move the flap lever after landing. This prevents uncommanded movement.

▼ Continued on next page ▼

▼ SPOILER PAIRS continued ▼

1 Choose one:

◆ Landing using flaps **25**:

Note: Use flaps 25 and VREF 25 + 5 for landing. This compensates for reduced flap effectiveness.



◆ Landing using flaps **30**:

Note: Use flaps 30 and VREF 30 + 5 for landing. This compensates for reduced flap effectiveness.



[] SPOILERS

Condition: One or more spoilers are failed.

Note: Roll rate may be reduced in flight. Speedbrake effectiveness may be reduced in flight and during landing.

Do not move the flap lever after landing. This prevents uncommanded movement.



[] STAB GREENBAND

Condition: One of these occurs:

- The nose gear pressure sensor disagrees with the computed stabilizer greenband
- The nose gear pressure sensor is failed

Objective: To verify the greenband is correct and the stabilizer trim is set correctly.

1 Check FMC weight and CG entries.

2 Reset stab trim if needed.

3 Choose one:

◆ STAB GREENBAND message **blanks**:



◆ STAB GREENBAND message **stays shown**:

Airplane loading may be incorrect or the nose gear pressure sensor may be failed.

►► **Go to step 4**

4 Check airplane loading and adjust as needed.

5 Verify that the stab trim is set to the FMC computed position.

6 The STAB GREENBAND message may stay shown. Continue normal operation.



STABILIZER CUTOUT

Condition: Both stabilizer cutout switches are in CUTOUT.

**[] STABILIZER L2**

Condition: The left stabilizer control path is failed.

1 L2 STAB cutout switch. CUTOUT

Note: The captain's control wheel pitch trim switches may be inoperative.

**[] STABILIZER R2**

Condition: The right stabilizer control path is failed.

1 R2 STAB cutout switch CUTOUT

Note: The first officer's control wheel pitch trim switches may be inoperative.



[] STALL PROTECTION

Condition: A stall protection fault occurs.

- 1 Tuning and control panel GPWS key Push
- 2 GPWS FLAP OVRD line select key OVRD

Note: Any stall indications should be considered valid.

Use flaps 20 and VREF 20 for landing.

3 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake _____
- Landing data **VREF 20, Minimums** _____
- Approach briefing Completed

Approach Checklist

- Altimeters _____

Landing Checklist

- Speedbrake ARMED
- Landing gear DOWN
- Flaps **20**



Table of Contents

AIRSPEED UNRELIABLE	10.1
Loss of All Displays	10.8
- - - - -	-
AIRSPEED UNRELIABLE	10.1
ALTN ATTITUDE CAPT, F/O	10.13
BARO SET DISAGREE.....	10.13
CHKL INCOMPLETE NORM	10.13
CHKL NON-NORMAL	10.14
EFIS/DSP PANEL L, R.....	10.14
HUD SNGL OPERATION	10.15
HUD SYS CAPT, F/O.....	10.15
HUD TAKEOFF	10.15
Loss of All Displays	10.8
SGL SOURCE ATTITUDE	10.16
SGL SOURCE RAD ALT	10.16

Table of Contents

Intentionally
Blank

[] AIRSPEED UNRELIABLE

Condition: The airspeed or Mach indications disagree with the AOA. (Indications of unreliable airspeed are listed in the Additional Information section of this checklist.)

- 1 Check the pitch attitude and thrust for the phase of flight.
- 2 **If** the pitch attitude or thrust are **not** normal for the phase of flight:

Autopilot disconnect switch Push

Autothrottle disconnect switch Push

F/D switches (both) OFF

Adjust the pitch attitude and thrust.

[Option – GE engines]

Note: The normal pitch attitude and thrust settings are available in the Flight With Unreliable Airspeed table in the Performance Inflight chapter.

Altitude, Vertical Speed, Reference N1, and Maximum N1 may be unreliable.

▼ Continued on next page ▼

▼ AIRSPEED UNRELIABLE continued ▼

[Option – RR engines]

Note: The normal pitch attitude and thrust settings are available in the Flight With Unreliable Airspeed table in the Performance Inflight chapter.

Altitude, Vertical Speed, Reference TPR, and Maximum TPR may be unreliable.

- 3 Compare the pitch attitude, thrust setting, and airspeed with the ground speed and the Flight With Unreliable Airspeed table in the Performance Inflight chapter.
- 4 AIR DATA/ATT source selector (captain or first officer) ALTN
- 5 Compare the normal airspeed with the AOA speed to determine which is correct.

▼ Continued on next page ▼

▼ AIRSPEED UNRELIABLE continued ▼

6 Choose one:

◆ Reliable airspeed data source **can** be determined:

AIR DATA/ATT source selector
(captain or first officer) . . . AUTO or ALTN

Select the position that provides the
more accurate airspeed indication.

Do **not** accomplish the following checklist:

ALTN ATTITUDE CAPT, F/O



◆ Reliable airspeed data source **cannot** be
determined:

► ► **Go to step 7**

- 7 Adjust the pitch attitude and thrust for the phase of flight.
- 8 Maintain a normal pitch attitude and thrust setting for the phase of flight. Refer to the Flight With Unreliable Airspeed table in the Performance Inflight chapter.

Note: Maintain airspeed at or above 130 knots.
Maintain visual conditions if possible.

- 9 Avoid abrupt control inputs. The airplane response is changed by simplified elevator feel and rudder ratio systems.

▼ Continued on next page ▼

▼ AIRSPEED UNRELIABLE continued ▼

10 Thrust levers (both) Retard to mid position

This prevents exceeding the thrust limits when switching to the alternate EEC mode.

Push one switch at a time.

11  EEC MODE switches (both) Off

Note: Maximum thrust limiting is not available with autothrottle disconnected. Alternate thrust setting information shows on the N1 indications.

12 Tuning and control panel
GPWS key Push

13 GPWS FLAP OVRD
line select key OVRD

Note: Inoperative Items

Autopilot inop

Autothrottle inop

Envelope protection functions inop

Thrust asymmetry protection inop

A ground proximity warning system fault occurs:
Some or all ground proximity alerts are not available. Ground proximity alerts that occur are valid.

▼ Continued on next page ▼

▼ **AIRSPEED UNRELIABLE continued** ▼

Note: The yaw damper is degraded.

Manual control inputs are needed to compensate for asymmetrical thrust conditions.

Use flaps 20 and VREF 20 for landing. If VREF 20 is less than 130 knots, use 130 knots for VREF. This ensures sufficient pitch trim and directional control capability for landing.

Do not arm the speedbrake lever. This prevents inadvertent in-flight speedbrake extension.

Manually extend the speedbrakes after landing.

Note: Establish landing configuration early.

Use electronic and visual glide slope indicators, where available, for approach and landing.

Refer to ground speed on the ND and reported wind for approach.

14 Do **not** accomplish the following checklists:

ENG EEC MODE L, R

FLIGHT CONTROL MODE

SGL SOURCE ATTITUDE

GND PROX SYS

15 **Checklist Complete Except Deferred Items**

▼ **Continued on next page** ▼

▼ AIRSPEED UNRELIABLE continued ▼

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake ____
- Landing data **VREF 20, Minimums** ____
- Approach briefing Completed

Approach Checklist

- Altimeters ____

Landing Checklist

- Speedbrake **DOWN**
- Landing gear DOWN
- Flaps **20**



Additional Information

The flight path vector is based on inertial sources and may be used as a reference in maintaining proper path control.

▼ Continued on next page ▼

▼ **AIRSPPEED UNRELIABLE** continued ▼

One or more of the following may be evidence of an unreliable airspeed or Mach indication:

- Speed/altitude information is not consistent with pitch attitude and thrust setting
- Airspeed failure flags
- The PFD current airspeed box is amber
- Blank or fluctuating airspeed displays
- An amber line is through one or more PFD flight mode annunciations
- Overspeed indications
- Radome damage or loss
- Simultaneous overspeed and stall warnings

One or more of the following EICAS messages may show:

- AIRSPEED LOW
- GND PROX SYS
- HEAT PITOT C
- HEAT PITOT L
- HEAT PITOT R
- HEAT PITOT L+C+R
- OVERSPEED
- WINDSHEAR SYS

Loss of All Displays

Condition: All five forward displays and both head-up displays are failed.

Objective: To restore partial display operation.

1 Engage the autopilot only in HDG HOLD, TRK HOLD, HDG SEL, or TRK SEL roll mode; and V/S, FPA, or altitude HOLD pitch mode.

2 Do not use LNAV, VNAV, or FLCH modes.

Note: Autothrottle is inoperative.

3 Use the captain’s audio control panel, TCP, and left VHF radio for communications.

Note: Window heat and wing anti-ice may be inoperative. Avoid icing conditions.

4 L CCR RESET switch Push

5 **Wait** 1 minute.

▼ Continued on next page ▼

▼ Loss of All Displays continued ▼

6 Choose one:

◆ **Partial** forward display operation is **restored**:

Note: Four forward displays are restored.
The lower display and both HUDs
stay blank.



◆ **All** forward displays **are blank**:

CCR RESET switches (both) Push

Wait 1 minute.

▶▶ **Go to step 7**

7 Choose one:

◆ **Partial** forward display operation is **restored**:



◆ **All** forward displays **are blank**:

▶▶ **Go to step 8**

8 Request radar vectors from ATC if available.

9 Left TCP NAV key Push

▼ Continued on next page ▼

▼ Loss of All Displays continued ▼

10 **If** alternate navigation capability is needed:

Note: Use the left TCP to enter the latitude (format DDMM.M) and longitude (format DDDMM.M) of the next waypoint or destination runway.

HEADING REF switch TRUE

MCP HDG/TRK reference switch TRK

Use autopilot TRK SEL mode to set the needed track.

Note: Monitor the left TCP and update the MCP selected track as needed.

▼ Continued on next page ▼

▼ Loss of All Displays continued ▼

Note: The following items may be inoperative:

FMC and CDU inop

Crew alert system inop

This includes Master Caution/Warning, crew alert messages, and aural and voice alerts. Scan indicator lights for non-normal operation.

Center tank fuel is unusable

Check destination fuel estimate. Verify that fuel is available in the main tanks to complete the flight.

First officer's and observer's audio control panels inop. Center and right TCPs inop

Voice communication on HF and SATCOM inop

Engine starters inop

Passenger oxygen inop

Cabin altitude alert inop

Windshear alerting inop

Wing anti-ice inop

All window heat inop

Landing gear normal extension inop

Alternate gear extension is needed.

Thrust reversers inop

Note: Plan more time for slower flap operation.

Estimate landing weight based on flight plan route and normal fuel flow.

Use flaps 20 and VREF 20 for landing. Refer to the VREF table in the Performance Inflight chapter for flap maneuvering speeds.

11 Checklist Complete Except Deferred Items

▼ Continued on next page ▼

▼ Loss of All Displays continued ▼

Deferred Items

Descent Checklist

- Notes. Checked
- Autobrake _____
- Landing data **VREF 20, Minimums**_____
- Approach briefing Completed
- | Left TCP NAV key Push
- | Left TCP NEXT PAGE key Push
- Left TCP CTRL line select key ON
- | Use the left TCP to tune the ILS frequency and course, or the GLS channel.

Approach Checklist

- Altimeters _____

Alternate gear extension

- Landing gear lever DN
- ALTN GEAR
extend switch Push to DOWN
and hold for 10 seconds
- | Confirm magnetic heading with the standby compass.

▼ Continued on next page ▼

▼ Loss of All Displays continued ▼

Landing Checklist

Speedbrake ARMED
 Landing gear DOWN
 Flaps 20



[] ALTN ATTITUDE CAPT, F/O

Condition: The affected AIR DATA/ATT source selector is in ALTN.

Note: The affected PFD and HUD show attitude information from the ISFD.



BARO SET DISAGREE

Condition: The captain's and first officer's barometric settings disagree.



[] CHKL INCOMPLETE NORM

Condition: A normal checklist needs to be completed.



[] CHKL NON-NORMAL

Condition: There is a hidden non-normal checklist. All of these occur:

- A non-normal checklist is not complete
- The ECL is not displayed
- The related EICAS message is not shown

**[] EFIS/DSP PANEL L, R**

Condition: One of these occurs:

- The affected EFIS/DSP is failed
- MFD control of the affected EFIS/DSP is used

Note: Backup control of the affected EFIS/DSP panel is accessed from the MFD system display, using the EFIS/DSP select key.

- 1 Select SYS on the MFD.
- 2 Select EFIS/DSP.
- 3 Select CAPT or F/O.
- 4 Select EFIS CTRL BACKUP.
- 5 Use backup control as needed.



[] HUD SNGL OPERATION

Condition: Only one head-up display functions.

Note: Only one HUD can function. To enable HUD operation for the pilot flying, stow the opposite HUD.

**HUD SYS CAPT, F/O**

Condition: The affected head-up display is failed.

**[] HUD TAKEOFF**

Condition: Head-up display takeoff guidance is not available.

- 1 **If** visibility is acceptable for takeoff without HUD guidance:
Continue normal operation.
- 2 Deselect HUD TAKEOFF on the FMC DEPARTURES page by selecting the active runway, then selecting EXECUTE. If needed, cycle the flight directors.



[] SGL SOURCE ATTITUDE

Condition: One of these occurs:

- Both AIR DATA/ATT source selectors are in the ALTN position
- All attitude information is lost from the IRUs and AHRUs

Note: Both PFDs and HUDs show attitude information from the Integrated Standby Flight Display.

**SGL SOURCE RAD ALT**

Condition: Both PFDs and HUDs use the same radio altimeter source.



Non-Normal Checklists
Flight Management, Navigation**Chapter NNC**
Section 11**Table of Contents**

AHRU ATT MODE L, R	11.1
FMC	11.2
FMC HOLD AIRSPACE.....	11.3
FMC INTERCEPT HDG.....	11.4
FMC MESSAGE	11.4
FMC PERF UNAVAIL	11.4
FMC RUNWAY DISAGREE.....	11.4
FMC UNABLE RTA	11.5
FMC VERIFY POSITION.....	11.5
GPS.....	11.5
INSUFFICIENT FUEL	11.6
IRU/AHRU MOTION	11.7
IRU ATT MODE L, R	11.7
LNAV BANK ANGLE LIM	11.7
NAV AIR DATA SYS.....	11.8
NAV AIRSPEED DATA.....	11.12
NAV APPROACH GLS.....	11.15
NAV APPROACH ILS.....	11.16
NAV INERTIAL SYS.....	11.17
NAV IRU	11.21
NAV SINGLE GPS	11.22
NAV UNABLE RNP.....	11.22
RWY/APP CRS ERROR	11.23
RWY/APP TUNE ERROR	11.23
SINGLE FMC.....	11.23
SGL SOURCE APPROACH	11.24

Table of Contents

SINGLE SOURCE FD..... 11.24

TCP ALTN NAV 11.24

TRANSPONDER 11.24

TRANSPONDER PANEL 11.25

WEATHER RADAR SYS..... 11.25

AHRU ATT MODE L, R

Condition: The AHRU is only providing pitch and roll guidance.



[] FMC

Condition: All 3 FMCs are failed.

- 1 LNAV and VNAV modes are inoperative. Select different autopilot roll and pitch modes.

Note: LNAV can be re-engaged. Plan to enter new waypoints by latitude and longitude into any TCP.

Note: Inoperative Items

LNAV

VNAV

All maps

All CDU pages

All navigation radios except ILS

All navigation functions except TCP ALTN NAV

- 2 Left tuning and control panel NAV key. Push
- 3 Select ALTN NAV Page 2.
- 4 ALTN NAV RADIO CTRL Select ON

Note: Current latitude and longitude are shown on the ALTN NAV page.

Tune the left ILS receiver by entering frequency and course on the left tuning and control panel. ILS will show on the captain’s PFD. First officer’s ILS information may be incorrect.

For flap maneuvering speeds, refer to the VREF table in the Performance Inflight chapter and to the Flap Maneuver Speed table below:

▼ Continued on next page ▼

▼ FMC continued ▼

FLAP POSITION	MANEUVER SPEED
FLAPS UP	VREF 30 + 80 or above lower amber band, whichever is higher
FLAPS 1	VREF 30 + 60
FLAPS 5	VREF 30 + 40
FLAPS 15	VREF 30 + 20
FLAPS 20	VREF 30 + 20
FLAPS 25	VREF 25
FLAPS 30	VREF 30

5 LDG ALT selector PULL ON, set manually

6 Do **not** accomplish the following checklist:

LANDING ALTITUDE



[] FMC HOLD AIRSPACE

Condition: The FMC calculated holding pattern is larger than the holding pattern airspace protection.

1 Decrease airspeed or advise ATC you are unable to comply with the holding airspace limits.



FMC INTERCEPT HDG

Condition: Both of these occur:

- LNAV is armed
- The airplane is not on an intercept heading to the active leg

**FMC MESSAGE**

Condition: An alerting message is in the CDU help window.

**[] FMC PERF UNAVAIL**

Condition: VNAV is selected and one or more of these is not entered:

- Gross weight
- Cost index
- Cruise altitude

- 1 Select the FMC PERF INIT page. Ensure that all needed data is entered.

**FMC RUNWAY DISAGREE**

[Option - FMC Runway Disagree]

Condition: The airplane is not on the FMC origin runway during takeoff.



FMC UNABLE RTA

Condition: The FMC is unable to reach the RTA fix at the Required Time of Arrival.

**[] FMC VERIFY POSITION**

Condition: The inputs to the FMC position disagree.

- 1 On the CDU, go to POS REF Page 4.
- 2 SENSOR SELECT line select key ON
- 3 Find the sensor with the largest position error and select it. The sensor indicates OFF and is not used for the FMC position calculation.
- 4 On the CDU, go to POS REF Page 2.
- 5 Select POS UPDATE ARM key.
- 6 Find the most accurate position.
- 7 Select the NOW key for that position.

**GPS**

Condition: Both GPS receivers are failed.



[] INSUFFICIENT FUEL

Condition: FMC estimated fuel at the destination is less than the entered RESERVES fuel.

- 1 The INSUFFICIENT FUEL message may be caused by an engine fuel leak. For indications of an engine fuel leak, check:

The total fuel remaining on EICAS compared to planned fuel remaining

Fuel flow indications, for an engine with excessive fuel flow

The individual tank quantities

The totalizer compared to calculated quantities (PROGRESS page 2/3). The TOTALIZER value is the sum of the individual tank quantities. The CALCULATED value is the totalizer value at engine start minus fuel used (calculated using fuel flow rates and time)

- 2 **If** there is an indication of an engine fuel leak:

► ► **Go to the Fuel Leak checklist on page 12.13**



[] IRU/AHRU MOTION

Condition: The airplane moves while the IRS aligns.

- 1 The airplane must be stopped to allow IRS alignment to complete.
- 2 **When** the IRU/AHRU align mode memo messages blank:

Continue normal operation.

**IRU ATT MODE L, R**

Condition: The IRU is only providing pitch and roll guidance.

**[] LNAV BANK ANGLE LIM**

Condition: The airplane may not follow an LNAV turn because bank angle is limited by available thrust or buffet.

- 1 If unable to stay within protected airspace, advise ATC.



[] NAV AIR DATA SYS

Condition: The three air data sources disagree.

- 1 Avoid abrupt control inputs. Airplane response is changed by simplified elevator feel and rudder ratio systems.

Note: Altitude is from GPS and is approximately equal to MSL altitude. Altimeter cannot be used to accurately maintain ATC-assigned altitudes.

Airspeed is calculated using angle of attack. Airspeed errors of up to 15 knots may exist at approach speeds.

- 2 Tuning and control panel GPWS key Push
- 3 GPWS FLAP OVRD line select key OVRD

Note: Inoperative Items

Autopilot inop

Autothrottles inop

Flight directors inop

Envelope protection functions inop

PFD flap maneuvering speeds inop

Note: Refer to the Flap Maneuver Speed table below:

▼ Continued on next page ▼

▼ NAV AIR DATA SYS continued ▼

FLAP POSITION	MANEUVER SPEED
FLAPS UP	VREF 30 + 80 or above lower amber band, whichever is higher
FLAPS 1	VREF 30 + 60
FLAPS 5	VREF 30 + 40
FLAPS 15	VREF 30 + 20
FLAPS 20	VREF 30 + 20
FLAPS 25	VREF 25
FLAPS 30	VREF 30

▼ Continued on next page ▼

▼ NAV AIR DATA SYS continued ▼

Note: Yaw damper is degraded.

Manual control inputs are needed to compensate for asymmetric thrust conditions.

Use flaps 20 and VREF 20 for landing. This ensures sufficient pitch control for landing.

Thrust asymmetry protection is inoperative. Maintain airspeed at or above 130 knots.

Avoid speedbrake use in flight.

Do not arm the speedbrake lever. This prevents inadvertent in-flight speedbrake extension.

Manually extend the speedbrakes after landing.

Run the engine and wing anti-ice systems manually.

Some or all ground proximity alerts are not available. Ground proximity alerts that occur are valid.

Some or all windshear alerts are not available. Windshear alerts that occur are valid.

4 Do **not** accomplish the following checklists:

ICE DETECTORS

THRUST ASYM PROT

AUTO SPEEDBRAKE

FLIGHT CONTROL MODE

▼ Continued on next page ▼

▼ NAV AIR DATA SYS continued ▼

GND PROX SYS

WINDSHEAR SYS

5 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked
Notes Checked
Autobrake ____
Landing data **VREF 20, Minimums** ____
Approach briefing Completed

Approach Checklist

Altimeters ____

Landing Checklist

Speedbrake **DOWN** |
Landing gear DOWN
Flaps **20**



[] NAV AIRSPEED DATA

Condition: Backup source for airspeed is being used instead of air data.

- 1 Avoid abrupt control inputs. Airplane response is changed by simplified elevator feel and rudder ratio systems.
- Note:** Airspeed is calculated using angle of attack. Airspeed errors of up to 15 knots may exist at approach speeds.
- 2 Tuning and control panel GPWS key Push
- 3 GPWS FLAP OVRD line select key OVRD

Note: Inoperative Items

Autopilot inop

Autothrottles inop

Flight directors inop

Envelope protection functions inop

PFD flap maneuvering speeds inop

Refer to the Flap Maneuver Speed table below:

▼ Continued on next page ▼

▼ NAV AIRSPEED DATA continued ▼

FLAP POSITION	MANEUVER SPEED
FLAPS UP	VREF 30 + 80 or above lower amber band, whichever is higher
FLAPS 1	VREF 30 + 60
FLAPS 5	VREF 30 + 40
FLAPS 15	VREF 30 + 20
FLAPS 20	VREF 30 + 20
FLAPS 25	VREF 25
FLAPS 30	VREF 30

▼ Continued on next page ▼

▼ NAV AIRSPEED DATA continued ▼

Note: Yaw damper is degraded.

Manual control inputs are needed to compensate for asymmetric thrust conditions.

Use flaps 20 and VREF 20 for landing. This ensures sufficient pitch control for landing.

Thrust asymmetry protection is inoperative. Maintain airspeed at or above 130 knots.

Avoid speedbrake use in flight.

Do not arm the speedbrake lever. This prevents inadvertent in-flight speedbrake extension.

Manually extend the speedbrakes after landing.

Run the engine and wing anti-ice systems manually.

Some or all ground proximity alerts are not available. Ground proximity alerts that occur are valid.

Some or all windshear alerts are not available. Windshear alerts that occur are valid.

4 Do **not** accomplish the following checklists:

ICE DETECTORS

THRUST ASYM PROT

AUTO SPEEDBRAKE

▼ Continued on next page ▼

▼ NAV AIRSPEED DATA continued ▼

FLIGHT CONTROL MODE

GND PROX SYS

WINDSHEAR SYS

Deferred Items

Descent Checklist

Recall Checked

Notes Checked

Autobrake ____

Landing data **VREF 20, Minimums** ____

Approach briefing Completed

Approach Checklist

Altimeters ____

Landing Checklist

Speedbrake **DOWN**

Landing gear DOWN

Flaps **20**



NAV APPROACH GLS

Condition: Both GLS systems are failed.



NAV APPROACH ILS

Condition: Both ILS systems are failed.



[] NAV INERTIAL SYS

Condition: The IRS cannot supply correct attitude, position, track, and groundspeed data.

- 1 Plan to land at the nearest suitable airport.

Note: Maintain airspeed at or above 130 knots.

- 2 Avoid abrupt control inputs. The airplane response is changed by simplified elevator feel and rudder ratio systems.
- 3 GPS continues to provide position and track information.

▼ Continued on next page ▼

▼ NAV INERTIAL SYS continued ▼

Note: Inoperative Items**Autopilot inop****Flight director inop****Envelope protection functions inop****All attitude information is lost from the IRUs and AHRUs**

Both PFDs and HUDs show attitude information from the Integrated Standby Flight Display.

FMC performance predictions inop**FMC VNAV pages inop****ND map provides no indication of drift angle because there is no heading bug****ND wind direction/speed and wind arrow inop****PFD flap maneuvering speeds inop****PFD vertical speed indicator inop****Thrust asymmetry protection inop****Autobrake inop****A windshear system fault occurs**

Windshear alerts that occur are valid.

A ground proximity warning system fault occurs

Ground proximity alerts that occur are valid.

A configuration warning system fault occurs

Radio altitude voice callouts and other aural alerts may not be available.

▼ Continued on next page ▼

▼ NAV INERTIAL SYS continued ▼

Terrain position data is lost

Position data for the ND terrain map and look-ahead terrain alerts are lost.

The air/ground thrust reverser logic is failed

Thrust reverser in-flight protection is failed. Reversers will deploy in flight if commanded. The ENG REV AIR/GND EICAS caution message will show at touchdown.

Note: Refer to the Flap Maneuver Speed table below:

FLAP POSITION	MANEUVER SPEED
FLAPS UP	VREF 30 + 80 or above lower amber band, whichever is higher
FLAPS 1	VREF 30 + 60
FLAPS 5	VREF 30 + 40
FLAPS 15	VREF 30 + 20
FLAPS 20	VREF 30 + 20
FLAPS 25	VREF 25
FLAPS 30	VREF 30

Note: If GPS is not available, the ND map mode is inoperative.

- 4 Tuning and control panel
GPWS key Push
- 5 GPWS FLAP OVRD
line select key OVRD

▼ Continued on next page ▼

▼ NAV INERTIAL SYS continued ▼

Note: The yaw damper is degraded.

Manual control inputs are needed to compensate for asymmetrical thrust conditions.

Use flaps 20 and VREF 20 for landing. If VREF 20 is less than 130 knots, use 130 knots for VREF. This ensures sufficient pitch trim and directional control capability for landing.

Do not arm the speedbrake lever. This prevents inadvertent in-flight speedbrake extension.

Manually extend the speedbrakes after landing.

6 Do **not** accomplish the following checklists:

THRUST ASYM PROT

ENG REV AIR/GND

AUTO SPEEDBRAKE

FLIGHT CONTROL MODE

SGL SOURCE ATTITUDE

CONFIG WARNING SYS

GND PROX SYS

TERR POS

WINDSHEAR SYS

| 7 Checklist Complete Except Deferred Items

▼ Continued on next page ▼

▼ NAV INERTIAL SYS continued ▼

Deferred Items**Descent Checklist**

Recall Checked

Notes Checked

Autobrake ____

Landing data **VREF 20, Minimums** ____

Approach briefing Completed

Approach Checklist

Altimeters ____

Landing Checklist

Speedbrake **DOWN**

Landing gear DOWN

Flaps **20**

**NAV IRU**

Condition: Both IRUs are inoperative.

Note: GPS navigation is available. Consider navigation equipment requirements for airspace on the route.



NAV SINGLE GPS

Condition: Only a single GPS is operating.

**[] NAV UNABLE RNP**

Condition: The actual navigational performance is not sufficient.

1 Choose one:

◆ On the **ground**:

Message may show with GPS disabled.



◆ In **flight**

►► **Go to step 2**

2 Choose one:

◆ On a procedure or an airway that **has an RNP alerting requirement**:

Select alternate procedure or airway.
During an approach, start a go-around.



◆ On a procedure or an airway **without RNP**:

Verify position.



[] RWY/APP CRS ERROR

Condition: The selected ILS course and the FMC runway course disagree.

- 1 Select the FMC NAV RADIO page.
- 2 Delete the manually entered ILS frequency, or select the correct course for the manually entered frequency.

**[] RWY/APP TUNE ERROR**

Condition: One of these occurs:

- The tuned ILS frequency and the FMC runway frequency disagree
- The tuned GLS channel and the FMC runway channel disagree

- 1 Select the FMC NAV RADIO page.
- 2 Delete manually entered ILS frequency or GLS channel, or select the correct procedure on DEP/ARR page.

**SINGLE FMC**

Condition: Only a single FMC is operating.



SGL SOURCE APPROACH

Condition: Both pilots' displays use the same ILS or GLS source.

**SINGLE SOURCE FD**

Condition: Both PFDs and HUDs use the same flight director source.

**TCP ALTN NAV**

Condition: The tuning and control panel alternate navigation control is used.

**TRANSPONDER**

Condition: The transponders are failed.



[] TRANSPONDER PANEL

Condition: One of these occurs:

- The transponder panel is failed
- TCP backup control of the transponder is used

- 1 TCP MENU keyPush
- 2 ALERT/XPDR CTRLSelect ON
- 3 ALERT/XPDRSelect

Note: TCP control of the glideslope inhibit, transponder mode, and aural cancel controls is accessed from the TCP MENU page.



WEATHER RADAR SYS

Condition: The weather radar system is inoperative.



Intentionally
Blank

Non-Normal Checklists**Chapter NNC****Fuel****Section 12****Table of Contents**

FUEL AUTO JETTISON	12.1
FUEL BALANCE SYS	12.4
FUEL CROSSFEED	12.6
FUEL DISAGREE	12.7
FUEL IMBALANCE	12.8
FUEL IN CENTER	12.9
FUEL JETT NOZZLE L, R	12.9
Fuel Jettison	12.10
FUEL JETTISON MAIN	12.11
FUEL JETTISON SYS	12.12
Fuel Leak	12.13
FUEL LOW CENTER	12.17
FUEL PRESS ENG L, R	12.18
FUEL PRESS ENG L+R	12.19
FUEL PUMP CENTER L, R	12.20
FUEL PUMP CTR L+R	12.21
FUEL PUMP L AFT, FWD	12.21
FUEL PUMP R AFT, FWD	12.21
FUEL QTY LOW	12.22
FUEL TEMP HIGH	12.25
FUEL TEMP LOW	12.26
FUEL VALVE APU	12.26

Table of Contents

Intentionally
Blank

[] FUEL AUTO JETTISON

Condition: One of these occurs:

- The total fuel quantity is less than the FUEL TO REMAIN and a jettison nozzle valve is open
- The fuel jettison automatic shutoff is failed

Objective: To manually close the fuel jettison nozzle valves when fuel jettison is complete.

[Option - English units]

1 Choose one:

◆ One or more tank quantity displays are **blank**:

Determine jettison time using the following rates:

Fuel in center tank: 3000 lb/minute

Center tank empty: 1250 lb/minute

▶ ▶ **Go to step 2**

◆ All tank quantity displays **stay shown**:

▶ ▶ **Go to step 2**

2 The FUEL TO REMAIN selector can be set for alerting.

3 FUEL JETTISON NOZZLE
valve switches (both) ON

▼ Continued on next page ▼

▼ FUEL AUTO JETTISON continued ▼

4 **When** fuel jettison is complete:

FUEL JETTISON NOZZLE

valve switches (both) Off

FUEL JETTISON ARM switch Off

FUEL TO REMAIN selector Off

5 Choose one:

◆ FUEL line on PERF INIT page is **blank**:

Wait 5 minutes. Manual entry of fuel quantity is not possible until 5 minutes after jettison is complete.

Enter the current estimated total fuel in the FUEL line box prompts on the PERF INIT page. This provides gross weight data for FMC performance calculations and allows VNAV to be re-engaged.

◆ FUEL line on PERF INIT page **shows**:6 Do **not** accomplish the following checklist:

Fuel Jettison

Intentionally
Blank

[] FUEL BALANCE SYS

Condition: One of these occurs:

- The fuel balance system is failed
- Fuel balance is inhibited when the center tank pumps are on

Objective: To manually balance fuel.

- 1 FUEL BALANCE switch Push to Off
Ensure the ON light is extinguished.
- 2 FUEL CROSSFEED switch On

▼ Continued on next page ▼

▼ FUEL BALANCE SYS continued ▼

3 Choose one:

◆ **Left** main tank quantity is low:

L FUEL PUMPS FWD and AFT
switches (both) Off

Do **not** accomplish the following checklists:

FUEL PUMP L AFT

FUEL PUMP L FWD

►► **Go to step 4**

◆ **Right** main tank quantity is low:

R FUEL PUMPS FWD and AFT
switches (both) Off

Do **not** accomplish the following checklists:

FUEL PUMP R AFT

FUEL PUMP R FWD

►► **Go to step 4**

4 **When** fuel balancing is complete:

FUEL PUMPS FWD and AFT
switches (all) ON

FUEL CROSSFEED switch. Off



[] FUEL CROSSFEED

Condition: The fuel crossfeed valve is not in the commanded position.

1 FUEL CROSSFEED switch Off

2 Choose one:

◆ FUEL CROSSFEED message **shows**:

Note: The fuel crossfeed valve may be open for the rest of the flight.



◆ FUEL CROSSFEED message is **blank**:

Note: Fuel crossfeed is not available.

Do **not** accomplish the following checklist:

FUEL BALANCE SYS



[] FUEL DISAGREE

Condition: The totalizer fuel quantity and the FMC calculated fuel quantity disagree.

Objective: To check for indications of a fuel leak and select the most accurate fuel value.

- 1 The FUEL DISAGREE message may be caused by an engine fuel leak. For indications of an engine fuel leak, check:

The total fuel remaining on EICAS compared to the planned fuel remaining.

The fuel flow indications, for an engine with an excessive fuel flow.

The individual tank quantities.

The totalizer compared to calculated quantities (PROGRESS page 2). The TOTALIZER value is the sum of the individual tank quantities. The CALCULATED value is the totalizer value at engine start minus fuel used (calculated using fuel flow rates and time).

- 2 **If** there is an indication of an engine fuel leak:

►► **Go to the Fuel Leak checklist on page 12.13**

- 3 Select PROGRESS page 2

- 4 TOTALIZER or
CALCULATED Select USE for
the most accurate value



[] FUEL IMBALANCE

Condition: There is a fuel imbalance between the main tanks.

Objective: To check for indications of an engine fuel leak and balance fuel.

- 1 The FUEL IMBALANCE message may be caused by an engine fuel leak. For indications of an engine fuel leak, check:

The total fuel remaining on EICAS compared to the planned fuel remaining.

The fuel flow indications, for an engine with an excessive fuel flow.

The individual tank quantities.

The totalizer compared to calculated quantities (PROGRESS page 2). The TOTALIZER value is the sum of the individual tank quantities. The CALCULATED value is the totalizer value at engine start minus fuel used (calculated using fuel flow rates and time).

- 2 **If** there is an indication of an engine fuel leak:

▶▶ Go to the Fuel Leak checklist on page 12.13, then finish this checklist.

- 3 FUEL BALANCE switch Push and hold for 1 second
- 4 The fuel balance system may take up to 30 seconds to activate.



FUEL IN CENTER

Condition: The center tank fuel quantity is at the level where the pump switches must be ON.



FUEL JETT NOZZLE L, R

Condition: The affected jettison nozzle valve is not in the commanded position.



Fuel Jettison

Condition: Fuel jettison is needed.

- 1 FUEL JETTISON ARM switch ARMED
- 2 Choose one:
 - ◆ FUEL TO REMAIN is **acceptable**:
 - ▶▶ **Go to step 3**
 - ◆ FUEL TO REMAIN must be **changed**:
 - FUEL TO REMAIN selector PULL ON, set manually
 - ▶▶ **Go to step 3**
- 3 FUEL JETTISON NOZZLE valve switches (both) ON
- 4 **When** fuel jettison is complete:
 - FUEL JETTISON NOZZLE valve switches (both) Off
 - FUEL JETTISON ARM switch Off
 - ■ ■ ■

[] FUEL JETTISON MAIN

Condition: The main tank fuel jettison system is failed.

- 1 Fuel jettison can occur only from the center tank.
- 2 Do **not** accomplish the following checklists:

Fuel Jettison

FUEL AUTO JETTISON

- 3 **When** the center tank is empty or the FUEL TO REMAIN quantity is reached:

FUEL JETTISON NOZZLE

valve switches (both) Off

FUEL JETTISON ARM switch Off

FUEL TO REMAIN selector Off |



[] FUEL JETTISON SYS

Condition: One of these occurs:

- The fuel jettison system is failed
- The fuel to remain selector is ON and the fuel jettison system is not armed

1 FUEL TO REMAIN selector Off

2 Wait 5 seconds.

3 Choose one:

◆ FUEL JETTISON SYS message **blanks**:



◆ FUEL JETTISON SYS message **shows**:

Note: The fuel jettison system is failed.
Fuel jettison is not available.

►► **Go to step 4**

4 FUEL JETTISON NOZZLE
valve switches (both) Off

5 FUEL JETTISON ARM switch Off

6 Do **not** accomplish the following checklist:

Fuel Jettison



Fuel Leak

Condition: An engine fuel leak is suspected or confirmed. (Indications of a fuel leak are listed in the Additional Information section of this checklist.)

Objective: To confirm that there is a fuel leak and shut down the affected engine if needed.

- 1 FUEL CENTER PUMPS switches (both) Off
 - 2 FUEL L PUMPS and R PUMPS
switches (all) ON
 - 3 FUEL CROSSFEED switch Off
 - 4 FUEL BALANCE switch Push to Off
- Ensure the ON light is extinguished.

- 5 Identify an engine fuel leak by verifying that a left or right main fuel tank quantity is decreasing faster than the other.
- 6 An increase in a fuel imbalance of approximately 1,000 lb in 30 minutes or less should be considered a fuel leak.
- 7 **If** conditions allow, visually check for an engine fuel leak.

▼ Continued on next page ▼

▼ Fuel Leak continued ▼

8 Choose one:

◆ An engine fuel leak is **confirmed**:

▶▶ **Go to step 9**

◆ An engine fuel leak is **not** confirmed:

Resume normal fuel management procedures.



9 A/T ARM switch

(affected side) Confirm OFF

10 Thrust lever

(affected side) Confirm Idle

11 FUEL CONTROL switch

(affected side) Confirm . . . CUTOFF

12 APU selector

(if APU available) START, then ON

13 TRANSPONDER MODE selector TA ONLY

Note: If the FUEL DISAGREE message shows at any time, go to PROGRESS page 2 and select the USE prompt above the TOTALIZER fuel quantity.

Note: After engine shutdown, all remaining fuel can be used for the operating engine. Resume normal fuel management procedures. Plan to balance fuel when the FUEL IMBALANCE message is shown.

14 Plan to land at the nearest suitable airport.

▼ Continued on next page ▼

▼ Fuel Leak continued ▼

15 Choose one:

◆ Landing using flaps **20**:

Tuning and control panel

GPWS key. Push

GPWS FLAP OVRD

line select key OVRD

Note: Use flaps 20 and VREF 20 for landing
and flaps 5 for go-around.

► ► **Go to step 16**

◆ Landing using flaps **30**
(if performance allows):

Note: Use flaps 30 and VREF 30 for landing
and flaps 20 for go-around.

► ► **Go to step 16**

16 Do **not** accomplish the following checklists:

AUTOTHROTTLE L, R

FUEL DISAGREE

17 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ Fuel Leak continued ▼

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake ____
- Landing data **VREF 20 or 30, Minimums**____
- Approach briefing Completed

Approach Checklist

- Altimeters ____

Landing Checklist

- Speedbrake ARMED
- Landing gear DOWN
- Flaps **20 or 30**



▼ Continued on next page ▼

▼ Fuel Leak continued ▼

Additional Information

One or more of the following may be an indication of a fuel leak:

- A visual observation of fuel spray from a strut or an engine
- An excessive engine fuel flow
- The total fuel quantity is decreasing at an abnormal rate
- The FUEL DISAGREE message shows on EICAS
- The FUEL IMBALANCE message shows on EICAS
- The FUEL QTY LOW message shows on EICAS
- The INSUFFICIENT FUEL message shows on EICAS

FUEL LOW CENTER

Condition: The center tank fuel quantity is at the level where the pump switches must be off.



[] FUEL PRESS ENG L, R

Condition: The affected engine is on suction feed.

Objective: To fly at an altitude that ensures a sufficient supply of fuel to the engine.

1 Choose one:

◆ Airplane altitude is **at or below** 35,000 feet:

▶▶ **Go to step 4**

◆ Airplane altitude is **above** 35,000 feet:

▶▶ **Go to step 2**

2 FUEL CROSSFEED switch On

This allows fuel from the operative pump side to feed both engines.

3 Descend to 35,000 feet.

4 **When** airplane altitude is at or below 35,000 feet:

FUEL CROSSFEED switch Off

This restores main tank-to-engine fuel feed.

Note: Do not climb above 35,000 feet for the rest of the flight.

Continue suction feed. Do not open the crossfeed valve.

The fuel balance system is inoperative. Do not balance fuel.

▼ Continued on next page ▼

▼ **FUEL PRESS ENG L, R continued** ▼

5 Do **not** accomplish the following checklist:

FUEL IMBALANCE



FUEL PRESS ENG L+R

Condition: Fuel pressure to both engines is low.



[] FUEL PUMP CENTER L, R

Condition: The affected center fuel pump pressure is low.

- 1 FUEL CROSSFEED switch On
- 2 **Wait** 20 seconds.
- 3 Choose one:

◆ FUEL CROSSFEED message is **blank**:

FUEL CENTER PUMP switch
(affected pump) Off

When FUEL LOW CENTER message is
shown:

FUEL CROSSFEED switch Off

FUEL CENTER PUMPS switch
(opposite pump) Off



◆ FUEL CROSSFEED message is **shown**:

►► **Go to step 4**

- 4 FUEL CROSSFEED switch Off
- 5 FUEL CENTER PUMPS switches (both) Off

This prevents a lateral imbalance from developing. The scavenge system will transfer center fuel to the main tanks.

- 6 The FUEL IN CENTER message may be shown.
Leave center pump switches off.

▼ **Continued on next page** ▼

▼ FUEL PUMP CENTER L, R continued ▼

7 Do **not** accomplish the following checklist:

FUEL CROSSFEED



[] FUEL PUMP CTR L+R

Condition: Both center fuel pump pressures are low.

- 1 FUEL CROSSFEED switch Off
- 2 FUEL CENTER PUMPS switches (both) Off
- 3 Center tank fuel is available. The scavenge system will transfer center fuel to the main tanks.



[] FUEL PUMP L AFT, FWD

Condition: The left affected fuel pump pressure is low.

- 1 L FUEL PUMPS switch (affected pump) Off



[] FUEL PUMP R AFT, FWD

Condition: The right affected fuel pump pressure is low.

- 1 R FUEL PUMPS switch (affected pump) Off



[] FUEL QTY LOW

Condition: The fuel quantity is low in a main tank.

Objective: To check for indications of a fuel leak and ensure that all fuel is available for use.

- 1 The FUEL QTY LOW message may be caused by an engine fuel leak. For indications of an engine fuel leak, check:

The total fuel remaining on EICAS compared to the planned fuel remaining.

The fuel flow indications, for an engine with an excessive fuel flow.

The individual tank quantities.

The totalizer compared to calculated quantities (PROGRESS page 2). The TOTALIZER value is the sum of the individual tank quantities. The CALCULATED value is the totalizer value at engine start minus fuel used (calculated using fuel flow rates and time).

- 2 **If** there is an indication of an engine fuel leak:

▶▶ **Go to the Fuel Leak checklist on page 12.13**

- 3 FUEL CROSSFEED switch On

This ensures that fuel is available to both engines if the low tank empties.

▼ Continued on next page ▼

▼ FUEL QTY LOW continued ▼

- 4 FUEL PUMPS switches (all). ON

This ensures that all fuel is available for use.

- 5 Plan to land at the nearest suitable airport.
- 6 Tuning and control panel GPWS key Push
- 7 GPWS FLAP OVRD line select key OVRD

Note: Use flaps 20 and VREF 20 for landing. Increased airspeed at flaps 20 gives improved elevator control for landing flare in the event of a dual engine flameout.

Avoid high nose up attitude and excessive acceleration or deceleration. This prevents the forward pumps from uncovering.

- 8 Do **not** accomplish the following checklists:

FUEL PUMP CTR L+R

FUEL PUMP L AFT

FUEL PUMP L FWD

FUEL PUMP R AFT

FUEL PUMP R FWD

- 9 **Checklist Complete Except Deferred Items**

▼ Continued on next page ▼

▼ FUEL QTY LOW continued ▼

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake ____
- Landing data **VREF 20, Minimums** ____
- Approach briefing Completed

Approach Checklist

- Altimeters ____

Landing Checklist

- Speedbrake ARMED
- Landing gear DOWN
- Flaps **20**



[] FUEL TEMP HIGH

Condition: Fuel temperature is near the maximum.

Objective: To reduce fuel heating.

- 1 C1 and C2 ELEC pump selectors (both) AUTO
- 2 L and R ELEC DEMAND
pump selectors (both). AUTO

Note: If TS-1 fuel is loaded, do not exceed 35,000 feet.

Avoid extended operation at low altitude.

Delay flap extension as long as practical.

After landing, do the engine shutdown procedure without delay. This prevents fuel system damage.

- 3 Do **not** accomplish the following checklists:

FUEL PUMP L AFT

FUEL PUMP L FWD

FUEL PUMP R AFT

FUEL PUMP R FWD



[] FUEL TEMP LOW

Condition: Fuel temperature is near the minimum.

- 1 Increase airspeed, change altitude, or deviate to a warmer air mass to achieve a TAT equal to or higher than the fuel temperature limit (3 degrees C above the fuel freeze point).
- 2 TAT increases approximately 0.5 to 0.7 degrees C for each .01 Mach increase in airspeed. In extreme conditions it may be necessary to descend as low as 25,000 feet.

**[] FUEL VALVE APU**

Condition: The APU fuel valve is not in the commanded position.

- 1 Do not start the APU.

This prevents a potential fire hazard.

Note: The APU is not available for the rest of the flight.

- 2 Do **not** accomplish the following checklist:

APU SHUTDOWN



Non-Normal Checklists

Chapter NNC

Hydraulics

Section 13

Table of Contents

HYD OVERHEAT C1.....	13.1
HYD OVERHEAT C2.....	13.1
HYD OVERHEAT DEM L, R.....	13.1
HYD OVERHEAT PRI L, R	13.2
HYD PRESS C1.....	13.2
HYD PRESS C2.....	13.3
HYD PRESS DEM L, R.....	13.3
HYD PRESS PRI L, R	13.4
HYD PRESS SYS C.....	13.5
HYD PRESS SYS L	13.8
HYD PRESS SYS L+C	13.9
HYD PRESS SYS L+C+R	13.13
HYD PRESS SYS L+R	13.14
HYD PRESS SYS R.....	13.17
HYD PRESS SYS R+C.....	13.18
HYD QTY LOW C, L, R	13.21
RAT UNLOCKED	13.21

Table of Contents

Intentionally
Blank

[] HYD OVERHEAT C1

Condition: The C1 pump temperature is high.

- 1 C1 ELEC pump selector OFF
- 2 Do **not** accomplish the following checklist:

HYD PRESS C1



[] HYD OVERHEAT C2

Condition: The C2 pump temperature is high.

- 1 C2 ELEC pump selector OFF
- 2 Do **not** accomplish the following checklist:

HYD PRESS C2



[] HYD OVERHEAT DEM L, R

Condition: The affected demand pump temperature is high.

- 1 ELEC DEMAND pump selector
(affected side) OFF

Note: Affected thrust reverser deployment may be slower than normal.

- 2 Do **not** accomplish the following checklist:

HYD PRESS DEM



[] HYD OVERHEAT PRI L, R

Condition: The affected primary pump temperature is high.

- 1 ENG PRIMARY pump switch
(affected side). Off
- 2 Do **not** accomplish the following checklist:
HYD PRESS PRI



[] HYD PRESS C1

Condition: The C1 pump pressure is low.

- 1 C1 ELEC pump selector ON
- 2 Choose one:
 - ◆ HYD PRESS C1 message **blanks**:
■ ■ ■ ■
 - ◆ HYD PRESS C1 message **stays shown**:
C1 ELEC pump selector. OFF



[] HYD PRESS C2

Condition: The C2 pump pressure is low.

1 C2 ELEC pump selector ON

2 Choose one:

◆ HYD PRESS C2 message **blanks**:



◆ HYD PRESS C2 message **stays shown**:

C2 ELEC pump selector OFF



[] HYD PRESS DEM L, R

Condition: The affected demand pump pressure is low when commanded on.

1 ELEC DEMAND pump selector
(affected pump) ON

2 Choose one:

◆ HYD PRESS DEM message **blanks**:



◆ HYD PRESS DEM message **stays shown**:

ELEC DEMAND pump selector
(affected pump) OFF

Note: Affected thrust reverser deployment may be slower than normal.



[] HYD PRESS PRI L, R

Condition: The affected primary pump pressure is low.

1 ENG PRIMARY pump switch (affected side) . . . Off



[] HYD PRESS SYS C

Condition: The center hydraulic system pressure is low.

Objective: To restore system pressure and configure for landing using alternate systems, if needed.

1 C2 ELEC pump selector ON

2 Choose one:

◆ HYD PRESS SYS C message **blanks**:



◆ HYD PRESS SYS C message **stays shown**:

►► **Go to step 3**

3 C1 ELEC pump selector AUTO

4 C2 ELEC pump selector OFF

5 Tuning and control panel GPWS key Push

6 GPWS FLAP OVRD line select key OVRD

Note: Inoperative Items

Primary flap and slat operation inop

Plan more time for slower flap and slat operation.

Landing gear normal extension inop

Alternate gear extension is needed.

Note: Slats will extend beyond midrange when airspeed is below 215 knots. For go-around, do not exceed 215 knots until slats retract to midrange.

▼ Continued on next page ▼

▼ HYD PRESS SYS C continued ▼

Note: Use flaps 20 and VREF 20 for landing. This ensures adequate go-around performance due to slower flap and slat operation in secondary mode.

Roll rate may be reduced in flight.
Speedbrake effectiveness may be reduced in flight and during landing.

Do not arm the speedbrake lever. This prevents inadvertent in-flight speedbrake extension.

Manually extend the speedbrakes after landing.

For go-around, do not exceed the gear EXTEND limit speed (270K/.82M).

Do not move the flap lever after landing. This prevents uncommanded movement.

7 Do **not** accomplish the following checklists:

- AUTO SPEEDBRAKE
- SPOILER PAIRS

8 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked

Notes. Checked

Autobrake _____

Landing data **VREF 20, Minimums**_____

Continued on next page ▼

▼ **HYD PRESS SYS C continued** ▼

Approach briefing Completed

Approach Checklist

Altimeters _____

Flap extension

Start flap extension as needed.

Alternate gear extension

Landing gear lever DN

ALTN GEAR
extend switch Push to DOWN
and hold until all gear
indicate down or in transit

Do **not** accomplish the following checklists:

FLAPS PRIMARY FAIL

SLATS PRIMARY FAIL

GEAR DOOR

Landing Checklist

Speedbrake **DOWN**

Landing gear DOWN

Flaps **20**



[] HYD PRESS SYS L

Condition: The left hydraulic system pressure is low.

1 L ELEC DEMAND pump selector ON

2 Choose one:

◆ HYD PRESS SYS L message **blanks**:



◆ HYD PRESS SYS L message **stays shown**:

►► **Go to step 3**

3 L ENG PRIMARY pump switch Off

4 L ELEC DEMAND pump selector OFF

Note: The left thrust reverser is inoperative. The right thrust reverser is available.

Note: Roll rate may be reduced in flight. Speedbrake effectiveness may be reduced in flight and during landing.

Do not move the flap lever after landing. This prevents uncommanded movement.

5 Do **not** accomplish the following checklist:

SPOILERS



[] HYD PRESS SYS L+C

Condition: The left and center hydraulic system pressures are low.

Objective: To restore system pressure and configure for landing using alternate systems, if needed.

- 1 L ELEC DEMAND pump selector ON
- 2 C2 ELEC pump selector ON
- 3 Choose one:
 - ◆ HYD PRESS SYS L+C message **blanks**:

■ ■ ■ ■
 - ◆ HYD PRESS SYS L+C message **stays shown**:

▶▶ **Go to step 4**
- 4 L ENG PRIMARY pump switch. Off
- 5 L ELEC DEMAND pump selector OFF
- 6 C1 ELEC pump selector AUTO
- 7 C2 ELEC pump selector OFF
- 8 Handling qualities are degraded. Pitch and roll control capability is reduced with fewer operating control surfaces.
- 9 Plan to land at the nearest suitable airport.
- 10 Tuning and control panel GPWS key Push

▼ Continued on next page ▼

▼ **HYD PRESS SYS L+C continued** ▼

11 GPWS FLAP OVRD line select key OVRD

Note: Inoperative Items

Multiple flight control surfaces inop

Handling qualities are degraded.

Primary flap and slat operation inop

Plan more time for slower flap and slat operation.

Landing gear normal extension inop

Alternate gear extension is needed.

Left thrust reverser inop

Right thrust reverser is available.

Note: Slats will extend beyond midrange when airspeed is below 215 knots. For go-around, do not exceed 215 knots until slats retract to midrange.

▼ **Continued on next page** ▼

▼ **HYD PRESS SYS L+C continued** ▼

Note: Use flaps 20 and VREF 30 + 20 for landing. Higher approach speeds improve airplane maneuvering characteristics.

Crosswind limit for landing is 20 knots.

Roll rate may be reduced in flight.

Speedbrake effectiveness may be reduced in flight and during landing.

Do not arm the speedbrake lever. This prevents inadvertent in-flight speedbrake extension.

Manually extend the speedbrakes after landing.

For go-around, do not exceed the gear EXTEND limit speed (270K/.82M).

Do not move the flap lever after landing. This prevents uncommanded movement.

12 Do **not** accomplish the following checklists:

AUTO SPEEDBRAKE

FLIGHT CONTROLS

SPOILER PAIRS

13 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked

Notes Checked

▼ **Continued on next page** ▼

▼ HYD PRESS SYS L+C continued ▼

- Autobrake _____
- Landing data**VREF 30 + 20, Minimums**_____
- Approach briefing Completed

Approach Checklist

- Altimeters _____

Flap extension

Start flap extension as needed.

Alternate gear extension

- Landing gear leverDN
- ALTN GEAR
extend switchPush to DOWN
and hold until all gear
indicate down or in transit

Do **not** accomplish the following checklists:

- FLAPS PRIMARY FAIL
- SLATS PRIMARY FAIL
- GEAR DOOR

Landing Checklist

- Speedbrake **DOWN**
- Landing gear DOWN

▼ Continued on next page ▼

▼ **HYD PRESS SYS L+C continued** ▼

Flaps. **20**



HYD PRESS SYS L+C+R

Condition: All hydraulic system pressures are low.



[] HYD PRESS SYS L+R

Condition: The left and right hydraulic system pressures are low.

Objective: To restore system pressure and configure for landing using alternate systems, if needed.

- 1 L ELEC DEMAND pump selector ON
- 2 R ELEC DEMAND pump selector ON
- 3 Choose one:

◆ HYD PRESS SYS L+R message **blanks**:



◆ HYD PRESS SYS L+R message **stays shown**:

►► **Go to step 4**

- 4 L ENG PRIMARY pump switch Off
- 5 R ENG PRIMARY pump switch Off
- 6 L ELEC DEMAND pump selector OFF
- 7 R ELEC DEMAND pump selector OFF
- 8 Handling qualities are degraded. Pitch and roll control capability is reduced with fewer operating control surfaces.
- 9 Plan to land at the nearest suitable airport.
- 10 Tuning and control panel GPWS key Push
- 11 GPWS FLAP OVRD line select key OVRD

▼ Continued on next page ▼

▼ HYD PRESS SYS L+R continued ▼

Note: Inoperative Items**Multiple flight control surfaces inop**

Handling qualities are degraded.

Left and right thrust reversers inop

Manual braking is available.

Note: Use flaps 20 and VREF 30 + 20 for landing. Higher approach speeds improve airplane maneuvering characteristics.

Crosswind limit for landing is 20 knots.

Roll rate may be reduced in flight.

Speedbrake effectiveness may be reduced in flight and during landing.

Do not move the flap lever after landing. This prevents uncommanded movement.

12 Do **not** accomplish the following checklists:

FLIGHT CONTROLS

SPOILER PAIRS

13 Checklist Complete Except Deferred Items

▼ Continued on next page ▼

▼ HYD PRESS SYS L+R continued ▼

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake ____
- Landing data**VREF 30 + 20, Minimums**____
- Approach briefing Completed

Approach Checklist

- Altimeters ____

Landing Checklist

- Speedbrake ARMED
- Landing gear DOWN
- Flaps **.20**



[] HYD PRESS SYS R

Condition: The right hydraulic system pressure is low.

1 R ELEC DEMAND pump selector ON

2 Choose one:

◆ HYD PRESS SYS R message **blanks**:



◆ HYD PRESS SYS R message **stays shown**:

▶▶ **Go to step 3**

3 R ENG PRIMARY pump switch Off

4 R ELEC DEMAND pump selector OFF

Note: The right thrust reverser is inoperative. The left thrust reverser is available.

Note: Roll rate may be reduced in flight.
Speedbrake effectiveness may be reduced in flight and during landing.

Do not move the flap lever after landing. This prevents uncommanded movement.

Use flaps 30 and VREF 30 + 5 for landing.
This compensates for reduced flap effectiveness.

5 Do **not** accomplish the following checklist:

SPOILER PAIRS



[] HYD PRESS SYS R+C

Condition: The right and center hydraulic system pressures are low.

Objective: To restore system pressure and configure for landing using alternate systems, if needed.

- 1 C2 ELEC pump selector ON
- 2 R ELEC DEMAND pump selector ON
- 3 Choose one:
 - ◆ HYD PRESS SYS R+C message **blanks**:

■ ■ ■ ■
 - ◆ HYD PRESS SYS R+C message **stays shown**:

▶▶ **Go to step 4**
- 4 C1 ELEC pump selector AUTO
- 5 C2 ELEC pump selector OFF
- 6 R ENG PRIMARY pump switch. Off
- 7 R ELEC DEMAND pump selector OFF
- 8 Handling qualities are degraded. Pitch and roll control capability is reduced with fewer operating control surfaces.
- 9 Plan to land at the nearest suitable airport.
- 10 Tuning and control panel GPWS key Push
- 11 GPWS FLAP OVRD line select key OVRD

▼ Continued on next page ▼

▼ HYD PRESS SYS R+C continued ▼

Note: Inoperative Items**Multiple flight control surfaces inop**

Handling qualities are degraded.

Primary flap and slat operation inop

Plan more time for slower flap and slat operation.

Landing gear normal extension inop

Alternate gear extension is needed.

Right thrust reverser inop

Left thrust reverser is available.

Note: Slats will extend beyond midrange when airspeed is below 215 knots. For go-around, do not exceed 215 knots until slats retract to midrange.

Note: Use flaps 20 and VREF 30 + 20 for landing. Higher approach speeds improve airplane maneuvering characteristics.

Crosswind limit for landing is 20 knots.

Roll rate may be reduced in flight.

Speedbrake effectiveness may be reduced in flight and during landing.

Do not arm the speedbrake lever. This prevents inadvertent in-flight speedbrake extension.

Manually extend the speedbrakes after landing.

For go-around, do not exceed the gear EXTEND limit speed (270K/.82M).

Do not move the flap lever after landing. This prevents uncommanded movement.

▼ Continued on next page ▼

▼ **HYD PRESS SYS R+C continued** ▼

12 Do **not** accomplish the following checklists:

- AUTO SPEEDBRAKE
- FLIGHT CONTROLS
- SPOILER PAIRS

13 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

- Recall Checked
- Notes. Checked
- Autobrake ____
- Landing data**VREF 30 + 20, Minimums**____
- Approach briefing Completed

Approach Checklist

- Altimeters ____

Flap extension

Start flap extension as needed.

Alternate gear extension

- Landing gear leverDN

▼ **Continued on next page** ▼

▼ **HYD PRESS SYS R+C continued** ▼

ALTN GEAR

extend switch Push to DOWN
and hold until all gear
indicate down or in transit

Do **not** accomplish the following checklists:

FLAPS PRIMARY FAIL

SLATS PRIMARY FAIL

GEAR DOOR

Landing Checklist

Speedbrake **DOWN**

Landing gear DOWN

Flaps **20**



HYD QTY LOW C, L, R

Condition: The hydraulic quantity is low.



RAT UNLOCKED

Condition: The ram air turbine is not stowed and locked.



Intentionally
Blank

Non-Normal Checklists

Chapter NNC

Landing Gear

Section 14

Table of Contents

ANTISKID	14.1
AUTOBRAKE	14.1
BRAKE TEMP.....	14.2
BRAKES	14.2
GEAR DISAGREE	14.3
GEAR DOOR	14.6
GEAR DRAG BRACE L, R.....	14.6
Gear Lever Locked Down.....	14.8
GEAR SIDE BRACE L, R	14.8
NOSE WHEEL STEERING	14.10
TILLER L, R	14.10
TIRE PRESS.....	14.10

Table of Contents

Intentionally
Blank

[] ANTISKID

Condition: An antiskid system fault occurs.

Note: The autobrake system is inoperative. Use minimum braking consistent with runway length and conditions. This reduces the possibility of tire blowout.

**AUTOBRAKE**

Condition: One of these occurs:

- The autobrake system is disarmed
- The autobrake system is failed



[] BRAKE TEMP

Condition: One or more brake temperatures are high.

1 Choose one:

◆ In **flight**:

Do not exceed the gear EXTEND limit speed (270K/.82M).

Landing gear lever DN

When the BRAKE TEMP message blanks:

Wait 8 minutes.

Landing gear lever UP



◆ On the **ground**:

Refer to the Recommended Brake Cooling Schedule table in the Performance Inflight chapter for the needed cooling time.

**[] BRAKES**

Condition: One or more of these occur:

- Two or more brakes are failed
- A dragging brake is detected

Note: Braking effectiveness is reduced. Refer to the Non-Normal Configuration Landing Distance table in the Performance Inflight chapter for flight planning.



[] GEAR DISAGREE

Condition: The gear position disagrees with the landing gear lever position.

Objective: To extend the gear using alternate gear extension, or land on the available gear.

Note: Do not exceed the gear EXTEND limit speed (270K/.82M).

1 Choose one:

◆ Landing gear lever is **UP**:

Note: Flight with the gear down increases fuel consumption and decreases climb performance. Refer to the Gear Down tables in the Performance Inflight chapter for flight planning.

Do **not** accomplish the following checklists:

AUTO SPEEDBRAKE

GEAR DOOR



◆ Landing gear lever is **DN**:

►► **Go to step 2**

2 ALTN GEAR

extend switch Push to DOWN
and hold until all gear
show down or in transit

▼ Continued on next page ▼

▼ **GEAR DISAGREE continued** ▼

3 Do **not** accomplish the following checklist:

GEAR DOOR

4 **Wait** 30 seconds.

5 Choose one:

◆ **All** gear indicate **DOWN**:



◆ **Any** gear indicate **UP or in transit**:

►► **Go to step 6**

6 Plan to land on the available gear.

7 Tuning and control panel GPWS key Push

8 GPWS GEAR OVRD line select key. OVRD

Note: Use flaps 30 for landing. This gives the slowest landing speed.

Do not arm the speedbrake lever.

When stopping distance is critical, extend the speedbrakes after all gear, or the nose, or the engine nacelle have contacted the runway.

Do not use the thrust reversers unless stopping distance is critical.

9 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked

▼ **Continued on next page** ▼

Approach briefing Completed

Approach Checklist

Altimeters

When at pattern altitude:

switches (both) Push to OPEN and
hold until the outflow
valve indications show fully
open to depressurize the airplane

FUEL PUMPS switches (all) Off

Do **not** accomplish the following checklists:

CABIN ALTITUDE AUTO

FUEL PRESS ENG L

FUEL PRESS ENG R

Landing Checklist

Flaps.....30



[] GEAR DOOR

Condition: One or more gear doors are not closed.

Note: Do not exceed the gear EXTEND limit speed (270K/.82M).

**[] GEAR DRAG BRACE L, R**

Condition: The affected main gear is down with the drag brace unlocked.

- 1 Tuning and control panel GPWS key Push
- 2 GPWS GEAR OVRD line select key OVRD
- 3 Increase airspeed until the GEAR DRAG BRACE message blanks. Increase to 270 knots/.82 Mach, if needed.
- 4 Choose one:

◆ GEAR DRAG BRACE message **blanks**:



◆ GEAR DRAG BRACE message **stays shown**:

Note: Use flaps 30 for landing. This gives the slowest landing speed.

Do not arm the speedbrake lever.

Manually extend the speedbrakes after landing.

►► **Go to step 5**

▼ Continued on next page ▼

▼ GEAR DRAG BRACE L, R continued ▼

5 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked
 Notes Checked
 Autobrake ____
 Landing data VREF __, Minimums____
 Approach briefing Completed

Approach Checklist

Altimeters ____

When at pattern altitude:

FUEL PUMPS switches (all) Off

Do **not** accomplish the following checklists:

FUEL PRESS ENG L

FUEL PRESS ENG R

Landing Checklist

Speedbrake **DOWN**
 Landing gear DOWN
 Flaps. **30**



Gear Lever Locked Down

Condition: The landing gear lever cannot move to UP.

- 1 Landing gear lever
LOCK OVRD switch Push and hold
- 2 Landing gear lever UP
■ ■ ■ ■

[] GEAR SIDE BRACE L, R

Condition: The affected main gear is down with the side brace unlocked.

- 1 Tuning and control panel GPWS key Push
- 2 GPWS GEAR OVRD line select key OVRD
- 3 Decrease airspeed until the GEAR SIDE BRACE message blanks. Decrease to VREF 30 and flaps 30, if needed.
- 4 Choose one:
 - ◆ GEAR SIDE BRACE message **blanks**:
■ ■ ■ ■
 - ◆ GEAR SIDE BRACE message **stays shown**:

Note: Use flaps 30 for landing. This gives the slowest landing speed.

Do not arm the speedbrake lever.

Manually extend the speedbrakes after landing.

►► **Go to step 5**

▼ Continued on next page ▼

▼ GEAR SIDE BRACE L, R continued ▼

5 Checklist Complete Except Deferred Items

Deferred Items

Descent Checklist

Recall Checked
 Notes Checked
 Autobrake ____
 Landing data VREF __, Minimums__
 Approach briefing Completed

Approach Checklist

Altimeters ____

When at pattern altitude:

FUEL PUMPS switches (all) Off

Do **not** accomplish the following checklists:

FUEL PRESS ENG L

FUEL PRESS ENG R

Landing Checklist

Speedbrake **DOWN**
 Landing gear DOWN
 Flaps **30**



NOSE WHEEL STEERING

Condition: Nose wheel steering is inoperative.

**TILLER L, R**

Condition: The affected tiller is failed.

**TIRE PRESS**

Condition: One or more tire pressures are not normal.



Non-Normal Checklists**Chapter NNC****Warning Systems****Section 15****Table of Contents**

AIRSPEED LOW	15.1
ALTITUDE ALERT	15.1
ALTITUDE CALLOUTS	15.1
AURAL CANCELED	15.1
CONFIG DOORS	15.1
CONFIG FLAPS	15.2
CONFIG GEAR	15.2
CONFIG PARKING BRAKE	15.2
CONFIG RUDDER	15.2
CONFIG SPOILERS	15.2
CONFIG STABILIZER	15.3
CONFIG WARNING SYS	15.3
GND PROX SYS	15.3
GPWS FLAP OVRD	15.3
GPWS GEAR OVRD	15.4
GPWS TERR OVRD	15.4
OVERSPEED	15.4
PILOT RESPONSE	15.4
TAIL STRIKE	15.5
TCAS	15.5
TCAS OFF	15.5
TCAS RA CAPTAIN, F/O	15.6
TERR POS	15.6
WINDSHEAR SYS	15.6

Table of Contents

Intentionally
Blank

AIRSPPEED LOW

Condition: Airspeed is less than minimum maneuvering speed.

**ALTITUDE ALERT**

Condition: A deviation from the MCP set altitude occurs.

**ALTITUDE CALLOUTS**

Condition: Altitude and minimums voice callouts during approach are not available.

**AURAL CANCELED**

Condition: The crew canceled the aural alert.

**CONFIG DOORS**

Condition: An entry, forward cargo, or aft cargo door is not closed and latched and locked during takeoff.



CONFIG FLAPS

Condition: The flaps are not in a takeoff position during takeoff.

**CONFIG GEAR**

Condition: A landing gear is not down and locked and one of these occurs:

- A thrust lever is at idle below 800 feet radio altitude
- The flaps are in a landing position

**CONFIG PARKING BRAKE**

Condition: The parking brake is set during takeoff.

**CONFIG RUDDER**

Condition: Rudder trim is not centered during takeoff.

**CONFIG SPOILERS**

Condition: The speedbrake lever is not down during takeoff.



CONFIG STABILIZER

Condition: The stabilizer is not in the greenband during takeoff.

**[] CONFIG WARNING SYS**

Condition: A configuration warning system fault occurs.

Note: Radio altitude voice callouts and other aural alerts may not be available.

**[] GND PROX SYS**

Condition: A ground proximity warning system fault occurs.

Note: Some or all ground proximity alerts are not available. Ground proximity alerts that occur are valid.

**GPWS FLAP OVRD**

Condition: The GPWS flap override is set to OVRD.



GPWS GEAR OVRD

Condition: The GPWS gear override is set to OVRD.



GPWS TERR OVRD

Condition: The GPWS terrain override is set to OVRD.



OVERSPEED

Condition: Airspeed is more than Vmo/Mmo.



PILOT RESPONSE

Condition: Pilot action is not detected during a specified time.



[] TAIL STRIKE

Condition: The tail hits the runway.

**Caution! Do not pressurize the airplane.
Pressurizing the airplane may cause
further structural damage.**

- 1 OUTFLOW VALVE switches (both) MAN
- 2 OUTFLOW VALVE MANUAL
switches (both) Push to OPEN and
hold until the outflow
valve indications show fully
open to depressurize the airplane
- 3 Plan to land at the nearest suitable airport.
- 4 Do **not** accomplish the following checklist:

CABIN ALTITUDE AUTO

**TCAS**

Condition: TCAS is failed.

**TCAS OFF**

Condition: TCAS modes TA or TA/RA are not selected.



TCAS RA CAPTAIN, F/O

Condition: TCAS cannot show RA guidance on the affected PFD and HUD.

**[] TERR POS**

Condition: Terrain position data is lost.

Note: Position data for the ND terrain map and look-ahead terrain alerts are lost. Ground proximity alerts that occur are valid.

**[] WINDSHEAR SYS**

Condition: A windshear system fault occurs.

Note: Some or all windshear alerts are not available. Windshear alerts that occur are valid.



Operations Information

Chapter OI

Table of Contents

Section 0

Ops Info	OL1
Introduction	OL1.1

Intentionally
Blank

Introduction

Note: This Section Reserved For Operator-Developed Information.

Intentionally
Blank

DO NOT USE FOR FLIGHT

787 Flight Crew Operations Manual

Performance Inflight - QRH
Table of Contents

Chapter PI

787-8 LB FAA - - - - - PI-QRH.10.1

Intentionally
Blank

Performance Inflight - QRH**Chapter PI-QRH****Table of Contents****Section 10****787-8 LB FAA****General PI-QRH.10.1**

Flight With Unreliable Airspeed /	
Turbulent Air Penetration	PI-QRH.10.1
Max Climb TPR	PI-QRH.10.3
VREF	PI-QRH.10.4

Advisory Information..... PI-QRH.11.1

Normal Configuration Landing Distance	PI-QRH.11.1
Non-Normal Configuration Landing Distance	PI-QRH.11.3
Recommended Brake Cooling Schedule	PI-QRH.11.19
Landing Climb Limit Weight	PI-QRH.11.21
Fuel Heating Schedule	PI-QRH.11.23

Engine Inoperative PI-QRH.12.1

Initial Max Continuous TPR	PI-QRH.12.1
Max Continuous TPR	PI-QRH.12.2
Driftdown Speed/Level Off Altitude	PI-QRH.12.5
Driftdown/LRC Cruise Range Capability	PI-QRH.12.6
Long Range Cruise Altitude Capability	PI-QRH.12.7
Long Range Cruise Control	PI-QRH.12.8
Long Range Cruise Diversion Fuel and Time	PI-QRH.12.9
Holding	PI-QRH.12.10
Gear Down Landing Rate of Climb Available	PI-QRH.12.11

Gear Down..... PI-QRH.13.1

220 KIAS Max Climb TPR	PI-QRH.13.1
Long Range Cruise Altitude Capability	PI-QRH.13.1
Long Range Cruise Control	PI-QRH.13.2
Long Range Cruise Enroute Fuel and Time	PI-QRH.13.3
Descent at 220 KIAS	PI-QRH.13.4
Holding	PI-QRH.13.4

Gear Down, Engine Inoperative	PI-QRH.14.1
Driftdown Speed/Level Off Altitude	PI-QRH.14.1
Long Range Cruise Altitude Capability	PI-QRH.14.1
Long Range Cruise Control	PI-QRH.14.2
Long Range Cruise Diversion Fuel and Time	PI-QRH.14.3
Holding	PI-QRH.14.4
Text	PI-QRH.20.1
Introduction	PI-QRH.20.1
General	PI-QRH.20.1
Advisory Information	PI-QRH.20.2
Engine Inoperative	PI-QRH.20.4

Performance Inflight - QRH**Chapter PI-QRH****General****Section 10****Flight With Unreliable Airspeed / Turbulent Air Penetration**

Altitude and/or vertical speed indications may also be unreliable.

Climb**Flaps Up, Set Max Climb Thrust**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 LB)				
		300	350	400	450	500
40000 (.85M)	PITCH ATT	3.5	3.5	3.5	3.5	
	V/S (FT/MIN)	1300	1000	600	100	
30000 (310 KIAS)	PITCH ATT	3.5	3.5	3.5	3.5	3.5
	V/S (FT/MIN)	2000	1700	1300	1100	900
20000 (290 KIAS)	PITCH ATT	6.5	6.0	6.0	6.0	6.0
	V/S (FT/MIN)	3500	2900	2400	2000	1700
10000 (290 KIAS)	PITCH ATT	9.0	8.5	8.0	7.5	7.5
	V/S (FT/MIN)	4600	3900	3300	2900	2500
SEA LEVEL (290 KIAS)	PITCH ATT	11.5	10.5	9.5	9.0	9.0
	V/S (FT/MIN)	5400	4500	3900	3400	3000

Cruise**Flaps Up, Set Thrust for Level Flight**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 LB)				
		300	350	400	450	500
40000 (.85M)	PITCH ATT	1.5	1.5	2.0		
	TPR	64.8	69.0	77.0		
35000 (310 KIAS)	PITCH ATT	1.0	1.0	1.5	2.0	2.0
	TPR	58.8	62.0	64.9	68.5	74.0
30000 (310 KIAS)	PITCH ATT	0.5	1.0	1.5	1.5	2.0
	TPR	54.1	56.0	58.5	61.1	63.9
25000 (310 KIAS)	PITCH ATT	0.5	1.0	1.5	1.5	2.0
	TPR	47.7	48.9	50.7	52.8	55.1
20000 (290 KIAS)	PITCH ATT	1.0	1.5	2.0	2.5	2.5
	TPR	39.4	40.9	42.6	44.7	47.1
15000 (290 KIAS)	PITCH ATT	1.0	1.5	2.0	2.5	3.0
	TPR	35.1	36.3	37.6	39.3	41.1

Descent**Flaps Up, Set Idle Thrust**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 LB)				
		300	350	400	450	500
40000 (.85M)	PITCH ATT	-2.0	-1.0	-1.0	-0.5	0.0
	V/S (FT/MIN)	-2700	-2500	-2500	-2600	-2900
30000 (310 KIAS)	PITCH ATT	-2.5	-2.0	-1.5	-1.0	-0.5
	V/S (FT/MIN)	-2600	-2300	-2100	-2000	-1900
20000 (290 KIAS)	PITCH ATT	-2.0	-1.5	-0.5	0.0	0.5
	V/S (FT/MIN)	-2100	-1900	-1800	-1700	-1600
10000 (290 KIAS)	PITCH ATT	-2.5	-1.5	-1.0	-0.5	0.5
	V/S (FT/MIN)	-2000	-1800	-1600	-1500	-1500
SEA LEVEL (290 KIAS)	PITCH ATT	-2.5	-1.5	-1.0	-0.5	0.0
	V/S (FT/MIN)	-1800	-1600	-1500	-1400	-1300

Flight With Unreliable Airspeed / Turbulent Air Penetration
Altitude and/or vertical speed indications may also be unreliable.

Holding

Flaps Up, Set Thrust for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)				
		300	350	400	450	500
10000	PITCH ATT	4.0	4.0	4.5	4.0	4.0
	TPR	24.6	27.3	29.9	32.5	35.1
	KIAS	206	217	226	240	259
5000	PITCH ATT	4.0	4.0	4.5	4.5	4.5
	TPR	21.7	24.1	26.3	28.6	30.9
	KIAS	206	216	225	235	249

Terminal Area (5000 FT)

Set Thrust for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)				
		300	350	400	450	500
FLAPS UP GEAR UP VREF30+80	PITCH ATT	4.5	5.0	5.0	5.5	6.0
	TPR	21.4	23.7	26	28.4	30.8
	KIAS	206	217	226	235	241
FLAPS 1 GEAR UP VREF30+60	PITCH ATT	6.0	6.5	6.5	7.0	7.5
	TPR	22.5	25.1	27.6	30.2	32.8
	KIAS	186	197	206	215	222
FLAPS 5 GEAR UP VREF30+40	PITCH ATT	3.5	3.5	4.0	4.0	4.5
	TPR	23.1	25.9	28.6	31.3	34.1
	KIAS	166	177	186	195	202
FLAPS 15 GEAR UP VREF30+20	PITCH ATT	4.5	5.0	5.0	5.0	5.5
	TPR	24.2	27.3	30.3	33.4	36.6
	KIAS	146	157	166	175	182
FLAPS 20 GEAR DOWN VREF30+20	PITCH ATT	3.0	3.5	3.5	3.5	4.0
	TPR	34.6	39.1	43.6	48.2	52.5
	KIAS	146	157	166	175	182

Final Approach (1500 FT)

Gear Down, Set Thrust for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)				
		300	350	400	450	500
FLAPS 20 VREF20+10	PITCH ATT	1.5	1.5	1.5	1.5	1.5
	TPR	15.8	17.4	19.0	20.6	22.1
	KIAS	138	149	158	168	177
FLAPS 25 VREF25+10	PITCH ATT	1.5	1.5	2.0	2.0	2.0
	TPR	17.1	18.9	20.6	22.4	24.1
	KIAS	137	148	157	166	175
FLAPS 30 VREF30+10	PITCH ATT	1.5	1.5	2.0	2.0	2.0
	TPR	18.9	21.0	23.0	25.1	27.1
	KIAS	135	144	154	163	171

Max Climb TPR

Based on anti-ice on or off

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KIAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
	310	310	310	310	310	310	310	0.85	0.85	0.85
60	48.9	49.0	51.2	55.6	58.0	61.8	66.2	73.7	71.4	70.2
50	55.6	55.2	54.2	55.6	58.0	61.8	66.2	73.7	71.4	70.2
40	62.0	62.8	61.6	61.0	59.2	61.8	66.2	73.7	71.4	70.2
30	63.7	70.0	69.4	69.9	67.9	67.1	67.3	73.7	71.4	70.2
20	64.0	70.3	75.7	78.4	77.2	76.2	76.2	76.2	71.9	70.7
15	64.2	70.5	75.9	82.1	81.3	80.9	80.8	80.4	76.3	75.2
10	64.4	70.7	76.1	82.3	85.8	85.3	85.5	84.7	80.7	79.6
5	64.5	70.9	76.3	82.5	87.2	89.6	89.8	89.1	85.3	84.1
0	64.7	71.0	76.5	82.7	87.4	91.8	93.9	93.5	89.8	88.6
-5	64.9	71.2	76.6	82.9	87.6	92.0	96.3	97.6	94.3	93.2
-10	65.0	71.4	76.8	83.1	87.8	92.2	96.5	101.9	98.8	97.9
-15	65.2	71.6	77.0	83.3	88.0	92.5	96.7	103.2	102.1	101.2
-20	65.3	71.8	77.2	83.5	88.3	92.7	96.9	103.4	102.3	101.5
-25	65.5	71.9	77.4	83.7	88.5	92.9	97.2	103.6	102.5	101.7
-30	65.7	72.1	77.6	84.0	88.7	93.1	97.4	103.9	102.8	101.9
-35	65.8	72.3	77.8	84.2	88.9	93.4	97.6	104.1	103.0	102.2
-40	66.0	72.5	78.0	84.4	89.1	93.6	97.9	104.4	103.3	102.4

VREF

WEIGHT (1000 LB)	FLAPS		
	30	25	20
500	161	164	166
480	158	162	164
460	156	160	161
440	153	156	157
420	149	152	154
400	145	149	150
380	142	145	146
360	138	141	142
340	134	137	138
320	130	133	134
300	126	129	130
280	122	124	125
260	120	120	121
240	120	120	121

For approach speed add wind factor of 1/2 headwind component + full gust (max 10 knots).

Performance Inflight - QRH
Advisory Information

Chapter PI-QRH
Section 11

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 30

Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (FT)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	370000 LB LANDING WEIGHT	PER 10000 LB ABOVE/ BELOW 370000 LB	PER 1000 FT STD/ HIGH*	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	2910	70/-40	60/80	-110	400	30	-30	60	-60	210	50	120
MAX AUTO	3940	70/-50	90/130	-170	570	0	0	90	-100	400	0	0
AUTOBRAKE 4	5100	100/-80	130/180	-240	820	10	-10	140	-140	560	10	10
AUTOBRAKE 3	6010	130/-110	170/220	-290	1010	30	-90	160	-160	530	70	80
AUTOBRAKE 2	6710	150/-130	200/270	-330	1140	120	-150	170	-180	490	380	400
AUTOBRAKE 1	7390	170/-150	230/320	-380	1330	220	-220	190	-200	490	830	1160

Good Reported Braking Action

MAX MANUAL	4000	70/-60	100/140	-190	680	90	-80	90	-100	300	230	540
MAX AUTO	4340	80/-60	110/150	-200	690	50	-40	100	-100	400	210	560
AUTOBRAKE 4	5100	100/-80	140/180	-240	830	20	-10	140	-140	560	30	90
AUTOBRAKE 3	6010	130/-110	170/220	-290	1010	30	-90	160	-160	530	70	80

Medium Reported Braking Action

MAX MANUAL	5340	120/-100	160/220	-290	1080	210	-170	140	-140	380	640	1630
MAX AUTO	5570	120/-100	160/230	-290	1070	200	-150	140	-140	430	640	1650
AUTOBRAKE 4	5770	120/-90	170/230	-300	1110	140	-100	150	-150	560	480	1530
AUTOBRAKE 3	6270	130/-120	190/250	-330	1190	130	-140	170	-170	530	310	1060

Poor Reported Braking Action

MAX MANUAL	6770	160/-140	240/320	-420	1620	460	-320	180	-190	440	1330	3860
MAX AUTO	7100	160/-140	230/320	-420	1600	460	-320	180	-190	440	1350	3910
AUTOBRAKE 4	7100	170/-130	240/330	-420	1610	450	-280	190	-190	530	1350	3910
AUTOBRAKE 3	7290	170/-140	240/330	-430	1650	380	-290	200	-200	530	1120	3720

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and 2 engine maximum reverse thrust.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (1000 ft of air distance).

Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.

For max manual braking and manual speedbrakes, increase reference landing distance by 260 ft.

*Altitude adjustment - Use STD up to 8000 ft pressure altitude, above 8000 ft,

Adjustment = $STD * 8 + HIGH * ((Press Alt / 1000) - 8)$.

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 25

Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (FT)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		VREF ADJ	REVERSE THRUST ADJ	
BRKING CONFIGURATION	370000 LB LANDING WEIGHT	PER 10000 LB ABOVE / BELOW 370000 LB	PER 1000 FT STD/ HIGH*	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF25	ONE REV	NO REV
MAX MANUAL	2970	70/-40	60/80	-120	400	30	-30	60	-60	210	60	130
MAX AUTO	4070	70/-60	100/130	-170	590	0	0	100	-100	410	0	0
AUTOBRAKE 4	5280	100/-90	140/190	-250	840	10	-10	140	-140	580	10	10
AUTOBRAKE 3	6230	130/-120	180/240	-300	1020	50	-100	170	-170	530	130	140
AUTOBRAKE 2	6880	150/-140	210/280	-340	1150	130	-160	170	-180	480	510	530
AUTOBRAKE 1	7520	180/-160	250/330	-380	1330	230	-230	190	-200	480	980	1390

Good Reported Braking Action

MAX MANUAL	4080	80/-70	110/140	-190	680	90	-80	100	-100	300	250	590
MAX AUTO	4440	80/-70	110/150	-200	700	50	-30	110	-110	410	200	590
AUTOBRAKE 4	5280	100/-90	140/190	-250	850	20	-10	140	-140	580	30	90
AUTOBRAKE 3	6230	130/-120	180/240	-300	1020	50	-100	170	-170	530	130	140

Medium Reported Braking Action

MAX MANUAL	5440	120/-110	170/230	-290	1080	210	-170	140	-140	380	690	1810
MAX AUTO	5680	120/-100	170/230	-290	1070	200	-150	140	-140	420	690	1820
AUTOBRAKE 4	5930	120/-110	170/240	-310	1120	130	-90	160	-160	580	470	1640
AUTOBRAKE 3	6480	140/-130	200/260	-340	1200	140	-150	180	-180	530	360	1160

Poor Reported Braking Action

MAX MANUAL	6890	170/-150	240/330	-420	1620	460	-320	190	-190	440	1420	4250
MAX AUTO	7230	170/-150	240/330	-420	1600	460	-320	190	-190	440	1440	4300
AUTOBRAKE 4	7230	170/-140	240/340	-420	1610	440	-260	190	-200	550	1420	4280
AUTOBRAKE 3	7480	170/-160	250/340	-430	1650	390	-290	200	-210	530	1180	4060

Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed and 2 engine maximum reverse thrust.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (1000 ft of air distance).

Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.

For max manual braking and manual speedbrakes, increase reference landing distance by 270 ft.

*Altitude adjustment - Use STD up to 8000 ft pressure altitude, above 8000 ft,

Adjustment = $STD * 8 + HIGH * ((Press Alt / 1000) - 8)$.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance Dry Runway

		LANDING DISTANCE AND ADJUSTMENT (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPEED ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	REF SPEED	370000 LB LDG WT	PER 10000 LB ABV/BLW 370000 LB	PER 1000 FT ABV S.L. STD/ HIGH*	HEAD/ TAIL WIND	DOWN/UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTI-ICE LEAK ENG L, R (FLAPS 20)	VREF20	3080	90/-50	70/90	-120/420	40/-40	60/-70	230	0	80
ANTI-ICE LEAK ENG L, R (FLAPS 30)	VREF30	2960	80/-50	60/80	-120/410	40/-30	60/-60	220	0	60
ANTISKID (FLAPS 25)	VREF25	5370	120/-120	170/230	-290/1080	210/-170	140/-140	380	690	1800
ANTISKID (FLAPS 30)	VREF30	5280	110/-120	160/220	-290/1080	210/-170	140/-140	380	640	1630
BRAKES (FLAPS 25)	VREF25	4050	160/-80	110/170	-190/680	90/-80	100/-100	290	250	590
BRAKES (FLAPS 30)	VREF30	3980	140/-80	100/140	-190/680	90/-80	90/-100	300	230	540
ENG FAIL L, R (FLAPS 20)	VREF20	3050	80/-50	70/90	-120/420	40/-30	60/-70	230	0	100
ENG FAIL L, R (FLAPS 30)	VREF30	2930	80/-50	60/80	-120/410	40/-30	60/-60	220	0	90
ENG LIMIT EXCEED L, R (FLAPS 20)	VREF20	3050	80/-50	70/90	-120/420	40/-30	60/-70	230	0	100
ENG LIMIT EXCEED L, R (FLAPS 30)	VREF30	2930	80/-50	60/80	-120/410	40/-30	60/-60	220	0	90
ENG OIL FILTER L, R (FLAPS 20)	VREF20	3050	80/-50	70/90	-120/420	40/-30	60/-70	230	0	100
ENG OIL FILTER L, R (FLAPS 30)	VREF30	2930	80/-50	60/80	-120/410	40/-30	60/-60	220	0	90
ENG OIL PRESS L, R (FLAPS 20)	VREF20	3050	80/-50	70/90	-120/420	40/-30	60/-70	230	0	100
ENG OIL PRESS L, R (FLAPS 30)	VREF30	2930	80/-50	60/80	-120/410	40/-30	60/-60	220	0	90

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes max manual braking and maximum available reverse thrust.

*Altitude adjustment - Use STD up to 8000 ft pressure altitude, above 8000 ft,

Adjustment = $STD * 8 + HIGH * ((Press Alt / 1000) - 8)$.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance Dry Runway

		LANDING DISTANCE AND ADJUSTMENT (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPEED ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	REF SPEED	370000 LB LDG WT	PER 10000 LB ABV/BLW 370000 LB	PER 1000 FT ABV S.L. STD/ HIGH*	HEAD/ TAIL WIND	DOWN/UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ENG OIL TEMP L, R (FLAPS 20)	VREF20	3050	80/-50	70/90	-120/420	40/-30	60/-70	230	0	100
ENG OIL TEMP L, R (FLAPS 30)	VREF30	2930	80/-50	60/80	-120/410	40/-30	60/-60	220	0	90
ENG SURGE L, R (FLAPS 20)	VREF20	3050	80/-50	70/90	-120/420	40/-30	60/-70	230	0	100
ENG SURGE L, R (FLAPS 30)	VREF30	2930	80/-50	60/80	-120/410	40/-30	60/-60	220	0	90
**ENG SVR DAMAGE/SEP L, R (FLAPS 20)	VREF20	3050	80/-50	70/90	-120/420	40/-30	60/-70	230	0	100
**ENG SVR DAMAGE/SEP L, R (FLAPS 30)	VREF30	2930	80/-50	60/80	-120/410	40/-30	60/-60	220	0	90
FIRE ENG L, R (FLAPS 20)	VREF20	3050	80/-50	70/90	-120/420	40/-30	60/-70	230	0	100
FIRE ENG L, R (FLAPS 30)	VREF30	2930	80/-50	60/80	-120/410	40/-30	60/-60	220	0	90
FLAP/SLAT CONTROL (FLAPS 20)	VREF20	3010	80/-50	70/90	-120/410	30/-30	60/-60	220	70	140
FLAPS DRIVE (UP < FLAPS ≤ 1)	VREF30+40	3690	130/-60	90/150	-140/480	40/-40	80/-80	240	120	270
FLAPS DRIVE (1 < FLAPS ≤ 5)	VREF30+40	3680	130/-60	90/150	-130/470	40/-40	80/-90	240	110	230
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	3310	100/-50	70/100	-130/430	40/-30	70/-70	210	80	180
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	3010	80/-50	70/90	-120/410	30/-30	60/-60	220	70	140
FLAPS PRIMARY FAIL (FLAPS 20)	VREF20	3300	80/-50	70/100	-130/440	40/-30	70/-70	250	70	160

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes max manual braking and maximum available reverse thrust.

*Altitude adjustment - Use STD up to 8000 ft pressure altitude, above 8000 ft,
Adjustment = STD*8+HIGH*((Press Alt/1000)-8).

**Unannunciated Non-Normal Checklist condition.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance Dry Runway

		LANDING DISTANCE AND ADJUSTMENT (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPEED ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	REF SPEED	370000 LB LDG WT	PER 10000 LB ABV/BLW 370000 LB	PER 1000 FT ABV S.L. STD/ HIGH*	HEAD/ TAIL WIND	DOWN/UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
FLIGHT CONTROL MODE (FLAPS 20)	VREF20	3350	70/-60	70/100	-130/440	40/-40	70/-70	260	80	170
FLIGHT CONTROLS (FLAPS 20)	VREF30+20	3550	80/-60	80/110	-130/460	50/-40	80/-80	260	110	250
**FUEL LEAK (FLAPS 20)	VREF20	3050	80/-50	70/90	-120/420	40/-30	60/-70	230	0	100
**FUEL LEAK (FLAPS 30)	VREF30	2930	80/-50	60/80	-120/410	40/-30	60/-60	220	0	90
FUEL QTY LOW (FLAPS 20)	VREF20	3010	80/-50	70/90	-120/410	30/-30	60/-60	220	70	140
HYD PRESS SYS C (FLAPS 20)	VREF20	3300	80/-50	70/100	-130/440	40/-30	70/-70	250	70	160
HYD PRESS SYS L (FLAPS 25)	VREF25	3060	80/-50	70/90	-120/420	40/-40	60/-70	230	0	70
HYD PRESS SYS L (FLAPS 30)	VREF30	2990	70/-50	60/80	-120/420	40/-30	60/-60	230	0	70
HYD PRESS SYS L+C (FLAPS 20)	VREF30+20	3890	90/-60	90/120	-150/500	50/-50	90/-90	300	0	130
HYD PRESS SYS L+R (FLAPS 20)	VREF30+20	3770	110/-60	90/110	-150/500	60/-60	90/-90	300	0	0
HYD PRESS SYS R (FLAPS 25)	VREF25	3100	80/-50	70/90	-120/430	40/-40	70/-70	240	0	80
HYD PRESS SYS R (FLAPS 30)	VREF30	3020	70/-50	60/80	-120/420	40/-40	60/-60	240	0	70
HYD PRESS SYS R+C (FLAPS 20)	VREF30+20	3960	90/-60	90/120	-150/510	60/-50	90/-90	310	0	140
NAV AIR DATA SYS (FLAPS 20)	VREF20	3230	80/-50	70/90	-120/430	30/-30	70/-70	230	60	140

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes max manual braking and maximum available reverse thrust.

*Altitude adjustment - Use STD up to 8000 ft pressure altitude, above 8000 ft,
Adjustment = $STD * 8 + HIGH * ((Press Alt / 1000) - 8)$.

**Unannunciated Non-Normal Checklist condition.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
Dry Runway

LANDING DISTANCE AND ADJUSTMENT (FT)										
EICAS MESSAGE	REF SPEED	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPEED ADJ	REVERSE THRUST ADJ	
		370000 LB LDG WT	PER 10000 LB ABV/BLW 370000 LB	PER 1000 FT ABV S.L. STD/HIGH*	HEAD/ TAIL WIND	DOWN/UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
NAV AIRSPEED DATA (FLAPS 20)	VREF20	3230	80/-50	70/90	-120/430	30/-30	70/-70	230	60	140
OVERHEAT ENG L, R (FLAPS 20)	VREF20	3050	80/-50	70/90	-120/420	40/-30	60/-70	230	0	100
OVERHEAT ENG L, R (FLAPS 30)	VREF30	2930	80/-50	60/80	-120/410	40/-30	60/-60	220	0	90
PITCH UP AUTHORITY (FLAPS ≥ 20)	VREF30+20	3400	90/-50	80/100	-130/440	40/-40	70/-80	230	90	200
PITCH UP AUTHORITY (FLAPS ≤ 15)	VREF30+40	3670	130/-60	90/150	-130/470	40/-40	80/-80	240	100	230
PRI FLIGHT COMPUTERS (FLAPS 20)	VREF20	3350	70/-60	70/100	-130/440	40/-40	70/-70	260	80	170
ROLL LEFT AUTHORITY (FLAPS 20)	VREF30+20	3350	90/-50	80/100	-130/430	40/-40	70/-70	220	90	190
ROLL RIGHT AUTHORITY (FLAPS 20)	VREF30+20	3350	90/-50	80/100	-130/430	40/-40	70/-70	220	90	190
SLATS DRIVE (FLAPS 20)	VREF30+30	3650	100/-60	90/110	-130/460	40/-40	80/-80	240	110	240
SPOILER PAIRS (FLAPS 25)	VREF25+5	3140	80/-50	70/90	-120/420	40/-30	70/-70	230	70	160
SPOILER PAIRS (FLAPS 30)	VREF30+5	3070	70/-50	70/90	-120/420	40/-30	60/-70	230	60	140
STABILIZER (FLAPS 20)	VREF30+20	3400	90/-50	80/100	-130/440	40/-40	70/-80	230	90	200

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (1000 ft air distance).
Assumes max manual braking and maximum available reverse thrust.

*Altitude adjustment - Use STD up to 8000 ft pressure altitude, above 8000 ft, Adjustment = STD*8+HIGH*((Press Alt/1000)-8).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPEED ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	REF SPEED	370000 LB LDG WT	PER 10000 LB ABV/BLW 370000 LB	PER 1000 FT ABV S.L. STD/ HIGH*	HEAD/ TAIL WIND	DOWN/UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTI-ICE LEAK ENG L, R (FLAPS 20)	VREF20	4400	80/-90	120/160	-210/750	120/-100	110/-110	340	0	380
ANTI-ICE LEAK ENG L, R (FLAPS 30)	VREF30	4210	80/-80	110/140	-210/730	110/-100	100/-100	330	0	310
ANTISKID (FLAPS 25)	VREF25	5370	120/-120	170/230	-290/1080	210/-170	140/-140	380	690	1800
ANTISKID (FLAPS 30)	VREF30	5280	110/-120	160/220	-290/1080	210/-170	140/-140	380	640	1630
BRAKES (FLAPS 25)	VREF25	5370	120/-120	170/230	-290/1080	210/-170	140/-140	380	690	1800
BRAKES (FLAPS 30)	VREF30	5280	110/-120	160/220	-290/1080	210/-170	140/-140	380	640	1630
ENG FAIL L, R (FLAPS 20)	VREF20	4330	80/-90	120/160	-210/730	110/-100	110/-110	340	0	430
ENG FAIL L, R (FLAPS 30)	VREF30	4140	80/-80	110/140	-200/720	110/-90	100/-100	330	0	360
ENG LIMIT EXCEED L, R (FLAPS 20)	VREF20	4330	80/-90	120/160	-210/730	110/-100	110/-110	340	0	430
ENG LIMIT EXCEED L, R (FLAPS 30)	VREF30	4140	80/-80	110/140	-200/720	110/-90	100/-100	330	0	360
ENG OIL FILTER L, R (FLAPS 20)	VREF20	4330	80/-90	120/160	-210/730	110/-100	110/-110	340	0	430
ENG OIL FILTER L, R (FLAPS 30)	VREF30	4140	80/-80	110/140	-200/720	110/-90	100/-100	330	0	360
ENG OIL PRESS L, R (FLAPS 20)	VREF20	4330	80/-90	120/160	-210/730	110/-100	110/-110	340	0	430
ENG OIL PRESS L, R (FLAPS 30)	VREF30	4140	80/-80	110/140	-200/720	110/-90	100/-100	330	0	360

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes max manual braking and maximum available reverse thrust.

*Altitude adjustment - Use STD up to 8000 ft pressure altitude, above 8000 ft,

Adjustment = $STD * 8 + HIGH * ((Press\ Alt / 1000) - 8)$.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPEED ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	REF SPEED	370000 LB LDG WT	PER 10000 LB ABV/BLW 370000 LB	PER 1000 FT ABV S.L. STD/ HIGH*	HEAD/ TAIL WIND	DOWN/UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ENG OIL TEMP L, R (FLAPS 20)	VREF20	4330	80/-90	120/160	-210/730	110/-100	110/-110	340	0	430
ENG OIL TEMP L, R (FLAPS 30)	VREF30	4140	80/-80	110/140	-200/720	110/-90	100/-100	330	0	360
ENG SURGE L, R (FLAPS 20)	VREF20	4330	80/-90	120/160	-210/730	110/-100	110/-110	340	0	430
ENG SURGE L, R (FLAPS 30)	VREF30	4140	80/-80	110/140	-200/720	110/-90	100/-100	330	0	360
**ENG SVR DAMAGE/SEP L, R (FLAPS 20)	VREF20	4330	80/-90	120/160	-210/730	110/-100	110/-110	340	0	430
**ENG SVR DAMAGE/SEP L, R (FLAPS 30)	VREF30	4140	80/-80	110/140	-200/720	110/-90	100/-100	330	0	360
FIRE ENG L, R (FLAPS 20)	VREF20	4330	80/-90	120/160	-210/730	110/-100	110/-110	340	0	430
FIRE ENG L, R (FLAPS 30)	VREF30	4140	80/-80	110/140	-200/720	110/-90	100/-100	330	0	360
FLAP/SLAT CONTROL (FLAPS 20)	VREF20	4120	80/-80	110/150	-190/690	90/-80	100/-100	300	270	650
FLAPS DRIVE (UP < FLAPS ≤ 1)	VREF30+40	4870	80/-90	140/180	-210/730	90/-80	120/-120	270	380	930
FLAPS DRIVE (1 < FLAPS ≤ 5)	VREF30+40	5090	90/-90	150/190	-220/750	110/-90	130/-130	290	390	940
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	4570	80/-90	130/170	-200/720	100/-90	110/-120	300	330	790
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	4120	80/-80	110/150	-190/690	90/-80	100/-100	300	270	650
FLAPS PRIMARY FAIL (FLAPS 20)	VREF20	4430	80/-90	120/160	-200/720	100/-90	100/-110	340	290	710

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes max manual braking and maximum available reverse thrust.

*Altitude adjustment - Use STD up to 8000 ft pressure altitude, above 8000 ft,
Adjustment = STD*8+HIGH*((Press Alt/1000)-8).

**Unannunciated Non-Normal Checklist condition.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPEED ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	REF SPEED	370000 LB LDG WT	PER 10000 LB ABV/BLW 370000 LB	PER 1000 FT ABV S.L. STD/ HIGH*	HEAD/ TAIL WIND	DOWN/UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
FLIGHT CONTROL MODE (FLAPS 20)	VREF20	4500	90/-90	120/170	-210/730	100/-90	110/-110	350	310	760
FLIGHT CONTROLS (FLAPS 20)	VREF30+20	4890	90/-90	140/190	-220/760	120/-100	120/-130	360	410	1000
**FUEL LEAK (FLAPS 20)	VREF20	4330	80/-90	120/160	-210/730	110/-100	110/-110	340	0	430
**FUEL LEAK (FLAPS 30)	VREF30	4140	80/-80	110/140	-200/720	110/-90	100/-100	330	0	360
FUEL QTY LOW (FLAPS 20)	VREF20	4120	80/-80	110/150	-190/690	90/-80	100/-100	300	270	650
HYD PRESS SYS C (FLAPS 20)	VREF20	4430	80/-90	120/160	-200/720	100/-90	100/-110	340	290	710
HYD PRESS SYS L (FLAPS 25)	VREF25	4370	80/-90	110/150	-210/750	120/-100	110/-110	340	0	360
HYD PRESS SYS L (FLAPS 30)	VREF30	4260	80/-80	110/140	-210/740	120/-100	100/-110	340	0	320
HYD PRESS SYS L+C (FLAPS 20)	VREF30+20	5500	100/-100	150/200	-250/860	150/-130	140/-140	420	0	580
HYD PRESS SYS L+R (FLAPS 20)	VREF30+20	5810	100/-110	150/200	-270/940	210/-180	150/-160	480	0	0
HYD PRESS SYS R (FLAPS 25)	VREF25	4430	80/-90	120/150	-210/760	120/-100	110/-110	360	0	380
HYD PRESS SYS R (FLAPS 30)	VREF30	4310	80/-80	110/150	-210/740	120/-100	100/-110	350	0	330
HYD PRESS SYS R+C (FLAPS 20)	VREF30+20	5630	100/-110	150/200	-250/870	160/-140	140/-150	450	0	630
NAV AIR DATA SYS (FLAPS 20)	VREF20	4330	80/-80	110/160	-200/710	90/-80	100/-100	320	270	640

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes max manual braking and maximum available reverse thrust.

*Altitude adjustment - Use STD up to 8000 ft pressure altitude, above 8000 ft,

Adjustment = $STD * 8 + HIGH * ((Press Alt / 1000) - 8)$.

**Unannunciated Non-Normal Checklist condition.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
Good Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPEED ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	REF SPEED	370000 LB LDG WT	PER 10000 LB ABV/BLW 370000 LB	PER 1000 FT ABV S.L. STD/ HIGH*	HEAD/ TAIL WIND	DOWN/UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
NAV AIRSPEED DATA (FLAPS 20)	VREF20	4330	80/-80	110/160	-200/710	90/-80	100/-100	320	270	640
OVERHEAT ENG L, R (FLAPS 20)	VREF20	4330	80/-90	120/160	-210/730	110/-100	110/-110	340	0	430
OVERHEAT ENG L, R (FLAPS 30)	VREF30	4140	80/-80	110/140	-200/720	110/-90	100/-100	330	0	360
PITCH UP AUTHORITY (FLAPS ≥ 20)	VREF30+20	4650	80/-90	130/170	-210/730	100/-90	110/-120	320	350	830
PITCH UP AUTHORITY (FLAPS ≤ 15)	VREF30+40	5060	90/-90	140/190	-210/750	100/-90	130/-130	290	380	920
PRI FLIGHT COMPUTERS (FLAPS 20)	VREF20	4500	90/-90	120/170	-210/730	100/-90	110/-110	350	310	760
ROLL LEFT AUTHORITY (FLAPS 20)	VREF30+20	4600	80/-90	130/170	-210/720	100/-90	110/-120	310	330	790
ROLL RIGHT AUTHORITY (FLAPS 20)	VREF30+20	4600	80/-90	130/170	-210/720	100/-90	110/-120	310	330	790
SLATS DRIVE (FLAPS 20)	VREF30+30	5000	90/-90	140/190	-220/760	110/-100	130/-130	320	390	950
SPOILER PAIRS (FLAPS 25)	VREF25+5	4310	80/-80	120/160	-200/710	100/-90	100/-110	320	300	700
SPOILER PAIRS (FLAPS 30)	VREF30+5	4210	80/-80	110/150	-200/700	100/-90	100/-100	320	270	620
STABILIZER (FLAPS 20)	VREF30+20	4650	80/-90	130/170	-210/730	100/-90	110/-120	320	350	830

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (1000 ft air distance).
Assumes max manual braking and maximum available reverse thrust.

*Altitude adjustment - Use STD up to 8000 ft pressure altitude, above 8000 ft,
Adjustment = STD*8+HIGH*((Press Alt/1000)-8).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance Medium Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPEED ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	REF SPEED	370000 LB LDG WT	PER 10000 LB ABV/BLW 370000 LB	PER 1000 FT ABV S.L. STD/ HIGH*	HEAD/ TAIL WIND	DOWN/UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTI-ICE LEAK ENG L, R (FLAPS 20)	VREF20	6190	140/-140	190/260	-350/1270	320/-250	160/-170	460	0	1220
ANTI-ICE LEAK ENG L, R (FLAPS 30)	VREF30	5920	130/-130	180/230	-340/1240	310/-240	160/-160	440	0	1000
ANTISKID (FLAPS 25)	VREF25	6740	170/-160	240/330	-420/1620	460/-320	190/-190	440	1420	4250
ANTISKID (FLAPS 30)	VREF30	6660	160/-160	240/320	-420/1620	460/-320	180/-190	440	1330	3860
BRAKES (FLAPS 25)	VREF25	6740	170/-160	240/330	-420/1620	460/-320	190/-190	440	1420	4250
BRAKES (FLAPS 30)	VREF30	6660	160/-160	240/320	-420/1620	460/-320	180/-190	440	1330	3860
ENG FAIL L, R (FLAPS 20)	VREF20	6050	140/-140	190/260	-340/1220	300/-240	170/-170	450	0	1340
ENG FAIL L, R (FLAPS 30)	VREF30	5780	130/-130	170/230	-330/1200	290/-230	160/-160	440	0	1120
ENG LIMIT EXCEED L, R (FLAPS 20)	VREF20	6050	140/-140	190/260	-340/1220	300/-240	170/-170	450	0	1340
ENG LIMIT EXCEED L, R (FLAPS 30)	VREF30	5780	130/-130	170/230	-330/1200	290/-230	160/-160	440	0	1120
ENG OIL FILTER L, R (FLAPS 20)	VREF20	6050	140/-140	190/260	-340/1220	300/-240	170/-170	450	0	1340
ENG OIL FILTER L, R (FLAPS 30)	VREF30	5780	130/-130	170/230	-330/-1200	290/-230	160/-160	440	0	1120
ENG OIL PRESS L, R (FLAPS 20)	VREF20	6050	140/-140	190/260	-340/1220	300/-240	170/-170	450	0	1340
ENG OIL PRESS L, R (FLAPS 30)	VREF30	5780	130/-130	170/230	-330/1200	290/-230	160/-160	440	0	1120

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes max manual braking and maximum available reverse thrust.

*Altitude adjustment - Use STD up to 8000 ft pressure altitude, above 8000 ft,

Adjustment = $STD * 8 + HIGH * ((Press Alt / 1000) - 8)$.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPEED ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	REF SPEED	370000 LB LDG WT	PER 10000 LB ABV/BLW 370000 LB	PER 1000 FT ABV S.L. STD/ HIGH*	HEAD/ TAIL WIND	DOWN/UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ENG OIL TEMP L, R (FLAPS 20)	VREF20	6050	140/-140	190/260	-340/1220	300/-240	170/-170	450	0	1340
ENG OIL TEMP L, R (FLAPS 30)	VREF30	5780	130/-130	170/230	-330/1200	290/-230	160/-160	440	0	1120
ENG SURGE L, R (FLAPS 20)	VREF20	6050	140/-140	190/260	-340/1220	300/-240	170/-170	450	0	1340
ENG SURGE L, R (FLAPS 30)	VREF30	5780	130/-130	170/230	-330/1200	290/-230	160/-160	440	0	1120
**ENG SVR DAMAGE/SEP L, R (FLAPS 20)	VREF20	6050	140/-140	190/260	-340/1220	300/-240	170/-170	450	0	1340
**ENG SVR DAMAGE/SEP L, R (FLAPS 30)	VREF30	5780	130/-130	170/230	-330/1200	290/-230	160/-160	440	0	1120
FIRE ENG L, R (FLAPS 20)	VREF20	6050	140/-140	190/260	-340/1220	300/-240	170/-170	450	0	1340
FIRE ENG L, R (FLAPS 30)	VREF30	5780	130/-130	170/230	-330/1200	290/-230	160/-160	440	0	1120
FLAP/SLAT CONTROL (FLAPS 20)	VREF20	5460	120/-120	180/240	-300/1090	220/-180	140/-150	380	730	1950
FLAPS DRIVE (UP < FLAPS ≤ 1)	VREF30+40	6440	130/-130	210/280	-310/1140	220/-180	170/-180	340	980	2690
FLAPS DRIVE (1 < FLAPS ≤ 5)	VREF30+40	6750	140/-140	220/300	-330/1180	240/-200	180/-190	370	1000	2680
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	6070	130/-130	200/260	-310/1140	230/-190	160/-170	390	870	2330
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	5460	120/-120	180/240	-300/1090	220/-180	140/-150	380	730	1950
FLAPS PRIMARY FAIL (FLAPS 20)	VREF20	5790	130/-130	180/250	-310/1130	230/-180	150/-150	420	790	2120

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes max manual braking and maximum available reverse thrust.

*Altitude adjustment - Use STD up to 8000 ft pressure altitude, above 8000 ft,
Adjustment = STD*8+HIGH*((Press Alt/1000)-8).

**Unannunciated Non-Normal Checklist condition.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance Medium Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPEED ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	REF SPEED	370000 LB LDG WT	PER 10000 LB ABV/BLW 370000 LB	PER 1000 FT ABV S.L. STD/ HIGH*	HEAD/ TAIL WIND	DOWN/UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
FLIGHT CONTROL MODE (FLAPS 20)	VREF20	5890	130/-130	190/260	-320/1140	240/-190	150/-160	440	830	2280
FLIGHT CONTROLS (FLAPS 20)	VREF30+20	6420	140/-140	210/290	-330/1190	260/-210	170/-180	440	1020	2800
**FUEL LEAK (FLAPS 20)	VREF20	6050	140/-140	190/260	-340/1220	300/-240	170/-170	450	0	1340
**FUEL LEAK (FLAPS 30)	VREF30	5780	130/-130	170/230	-330/1200	290/-230	160/-160	440	0	1120
FUEL QTY LOW (FLAPS 20)	VREF20	5460	120/-120	180/240	-300/1090	220/-180	140/-150	380	730	1950
HYD PRESS SYS C (FLAPS 20)	VREF20	5790	130/-130	180/250	-310/1130	230/-180	150/-150	420	790	2120
HYD PRESS SYS L (FLAPS 25)	VREF25	6160	130/-140	190/250	-350/1270	320/-250	160/-170	460	0	1180
HYD PRESS SYS L (FLAPS 30)	VREF30	6000	130/-130	180/240	-340/1250	320/-240	160/-160	460	0	1040
HYD PRESS SYS L+C (FLAPS 20)	VREF30+20	7630	160/-160	240/320	-400/1410	400/-310	210/-210	550	0	1750
HYD PRESS SYS L+R (FLAPS 20)	VREF30+20	9050	170/-180	260/340	-490/1720	690/-500	250/-250	680	0	0
HYD PRESS SYS R (FLAPS 25)	VREF25	6260	140/-140	190/260	-350/1280	330/-260	170/-170	480	0	1240
HYD PRESS SYS R (FLAPS 30)	VREF30	6080	130/-130	180/240	-350/1270	330/-250	160/-160	470	0	1080
HYD PRESS SYS R+C (FLAPS 20)	VREF30+20	7830	160/-170	250/330	-410/1440	420/-330	210/-220	580	0	1910
NAV AIR DATA SYS (FLAPS 20)	VREF20	5650	120/-120	180/240	-300/1110	210/-170	140/-150	400	730	1930

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes max manual braking and maximum available reverse thrust.

*Altitude adjustment - Use STD up to 8000 ft pressure altitude, above 8000 ft,
Adjustment = $STD * 8 + HIGH * ((Press Alt / 1000) - 8)$.

**Unannunciated Non-Normal Checklist condition.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
Medium Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPEED ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	REF SPEED	370000 LB LDG WT	PER 10000 LB ABV/BLW 370000 LB	PER 1000 FT ABV S.L. STD/ HIGH*	HEAD/ TAIL WIND	DOWN/UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
NAV AIRSPEED DATA (FLAPS 20)	VREF20	5650	120/-120	180/240	-300/1110	210/-170	140/-150	400	730	1930
OVERHEAT ENG L, R (FLAPS 20)	VREF20	6050	140/-140	190/260	-340/1220	300/-240	170/-170	450	0	1340
OVERHEAT ENG L, R (FLAPS 30)	VREF30	5780	130/-130	170/230	-330/1200	290/-230	160/-160	440	0	1120
PITCH UP AUTHORITY (FLAPS ≥ 20)	VREF30+20	6090	130/-130	200/270	-320/1140	230/-190	160/-170	390	860	2310
PITCH UP AUTHORITY (FLAPS ≤ 15)	VREF30+40	6690	140/-140	220/300	-330/1180	240/-200	180/-190	360	970	2590
PRI FLIGHT COMPUTERS (FLAPS 20)	VREF20	5890	130/-130	190/260	-320/1140	240/-190	150/-160	440	830	2280
ROLL LEFT AUTHORITY (FLAPS 20)	VREF30+20	6060	130/-130	200/260	-310/1140	230/-190	160/-170	380	850	2260
ROLL RIGHT AUTHORITY (FLAPS 20)	VREF30+20	6060	130/-130	200/260	-310/1140	230/-190	160/-170	380	850	2260
SLATS DRIVE (FLAPS 20)	VREF30+30	6540	140/-140	220/290	-330/1180	250/-200	180/-180	390	960	2580
SPOILER PAIRS (FLAPS 25)	VREF25+5	5710	130/-130	180/250	-310/1120	230/-190	150/-160	400	780	2080
SPOILER PAIRS (FLAPS 30)	VREF30+5	5590	120/-120	180/240	-300/1110	230/-190	150/-150	400	720	1850
STABILIZER (FLAPS 20)	VREF30+20	6090	130/-130	200/270	-320/1140	230/-190	160/-170	390	860	2310

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (1000 ft air distance).
Assumes max manual braking and maximum available reverse thrust.

*Altitude adjustment - Use STD up to 8000 ft pressure altitude, above 8000 ft,
Adjustment = STD*8+HIGH*((Press Alt/1000)-8).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance Poor Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPEED ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	REF SPEED	370000 LB LDG WT	PER 10000 LB ABV/BLW 370000 LB	PER 1000 FT ABV S.L. STD/ HIGH*	HEAD/ TAIL WIND	DOWN/UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTI-ICE LEAK ENG L, R (FLAPS 20)	VREF20	8340	200/-200	290/400	-540/2060	820/-520	230/-230	560	0	3070
ANTI-ICE LEAK ENG L, R (FLAPS 30)	VREF30	7990	190/-190	270/360	-530/2030	800/-510	220/-220	540	0	2530
ANTISKID (FLAPS 25)	VREF25	8790	250/-240	380/520	-660/2770	1670/-670	260/-270	490	3390	15310
ANTISKID (FLAPS 30)	VREF30	8700	250/-230	370/510	-660/2760	1670/-680	260/-270	500	3220	14080
BRAKES (FLAPS 25)	VREF25	8010	220/-210	320/440	-560/2270	950/-510	230/-240	480	2450	8720
BRAKES (FLAPS 30)	VREF30	7920	210/-200	310/430	-560/2270	960/-520	230/-240	480	2310	7960
ENG FAIL L, R (FLAPS 20)	VREF20	8050	200/-200	290/390	-510/1940	730/-480	240/-240	550	0	3320
ENG FAIL L, R (FLAPS 30)	VREF30	7700	190/-190	260/350	-500/1900	710/-460	220/-230	530	0	2770
ENG LIMIT EXCEED L, R (FLAPS 20)	VREF20	8050	200/-200	290/390	-510/1940	730/-480	240/-240	550	0	3320
ENG LIMIT EXCEED L, R (FLAPS 30)	VREF30	7700	190/-190	260/350	-500/1900	710/-460	220/-230	530	0	2770
ENG OIL FILTER L, R (FLAPS 20)	VREF20	8050	200/-200	290/390	-510/1940	730/-480	240/-240	550	0	3320
ENG OIL FILTER L, R (FLAPS 30)	VREF30	7700	190/-190	260/350	-500/1900	710/-460	220/-230	530	0	2770
ENG OIL PRESS L, R (FLAPS 20)	VREF20	8050	200/-200	290/390	-510/1940	730/-480	240/-240	550	0	3320
ENG OIL PRESS L, R (FLAPS 30)	VREF30	7700	190/-190	260/350	-500/1900	710/-460	220/-230	530	0	2770

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes max manual braking and maximum available reverse thrust.

*Altitude adjustment - Use STD up to 8000 ft pressure altitude, above 8000 ft,

Adjustment = $STD * 8 + HIGH * ((Press Alt / 1000) - 8)$.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPEED ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	REF SPEED	370000 LB LDG WT	PER 10000 LB ABV/BLW 370000 LB	PER 1000 FT ABV S.L. STD/ HIGH*	HEAD/ TAIL WIND	DOWN/UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ENG OIL TEMP L, R (FLAPS 20)	VREF20	8050	200/-200	290/390	-510/1940	730/-480	240/-240	550	0	3320
ENG OIL TEMP L, R (FLAPS 30)	VREF30	7700	190/-190	260/350	-500/1900	710/-460	220/-230	530	0	2770
ENG SURGE L, R (FLAPS 20)	VREF20	8050	200/-200	290/390	-510/1940	730/-480	240/-240	550	0	3320
ENG SURGE L, R (FLAPS 30)	VREF30	7700	190/-190	260/350	-500/1900	710/-460	220/-230	530	0	2770
**ENG SVR DAMAGE/SEP L, R (FLAPS 20)	VREF20	8050	200/-200	290/390	-510/1940	730/-480	240/-240	550	0	3320
**ENG SVR DAMAGE/SEP L, R (FLAPS 30)	VREF30	7700	190/-190	260/350	-500/-1900	710/-460	220/-230	530	0	2770
FIRE ENG L, R (FLAPS 20)	VREF20	8050	200/-200	290/390	-510/1940	730/-480	240/-240	550	0	3320
FIRE ENG L, R (FLAPS 30)	VREF30	7700	190/-190	260/350	-500/1900	710/-460	220/-230	530	0	2770
FLAP/SLAT CONTROL (FLAPS 20)	VREF20	6840	170/-170	250/350	-430/1630	460/-320	190/-200	440	1500	4570
FLAPS DRIVE (UP < FLAPS ≤ 1)	VREF30+40	8010	180/-180	300/410	-440/1690	450/-330	230/-230	400	1910	6090
FLAPS DRIVE (1 < FLAPS ≤ 5)	VREF30+40	8410	200/-200	320/430	-460/1750	500/-360	240/-250	430	1950	5980
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	7600	180/-180	280/380	-450/1690	490/-350	210/-220	450	1740	5380
FLAPS DRIVE (FLAPS ≥ 20)	VREF20	6840	170/-170	250/350	-430/1630	460/-320	190/-200	440	1500	4570
FLAPS PRIMARY FAIL (FLAPS 20)	VREF20	7190	180/-170	260/360	-440/1670	480/-340	200/-200	480	1600	4970

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes max manual braking and maximum available reverse thrust.

*Altitude adjustment - Use STD up to 8000 ft pressure altitude, above 8000 ft,
Adjustment = STD*8+HIGH*((Press Alt/1000)-8).

**Unannunciated Non-Normal Checklist condition.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance Poor Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPEED ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	REF SPEED	370000 LB LDG WT	PER 10000 LB ABV/BLW 370000 LB	PER 1000 FT ABV S.L. STD/ HIGH*	HEAD/ TAIL WIND	DOWN/UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
FLIGHT CONTROL MODE (FLAPS 20)	VREF20	7310	180/-180	270/380	-450/1690	500/-350	250/-210	500	1680	5330
FLIGHT CONTROLS (FLAPS 20)	VREF30+20	7960	190/-190	300/410	-460/1740	530/-380	230/-230	490	1950	6190
**FUEL LEAK (FLAPS 20)	VREF20	8050	200/-200	290/390	-510/1940	730/-480	240/-240	550	0	3320
**FUEL LEAK (FLAPS 30)	VREF30	7700	190/-190	260/350	-500/1900	710/-460	220/-230	530	0	2770
FUEL QTY LOW (FLAPS 20)	VREF20	6840	170/-170	250/350	-430/1630	460/-320	190/-200	440	1500	4570
HYD PRESS SYS C (FLAPS 20)	VREF20	7190	180/-170	260/360	-440/1670	480/-340	200/-200	480	1600	4970
HYD PRESS SYS L (FLAPS 25)	VREF25	8310	200/-200	290/380	-540/2060	830/-520	230/-230	560	0	2970
HYD PRESS SYS L (FLAPS 30)	VREF30	8090	190/-190	270/370	-540/2040	820/-520	230/-230	550	0	2630
HYD PRESS SYS L+C (FLAPS 20)	VREF30+20	10090	230/-230	360/480	-600/2250	980/-620	290/-290	640	0	4200
HYD PRESS SYS L+R (FLAPS 20)	VREF30+20	13810	260/-270	400/530	-860/3170	2480/-1290	380/-350	860	0	0
HYD PRESS SYS R (FLAPS 25)	VREF25	8450	200/-200	290/390	-550/2090	860/-540	240/-240	580	0	3130
HYD PRESS SYS R (FLAPS 30)	VREF30	8210	190/-200	280/370	-540/2060	840/-530	230/-230	570	0	2750
HYD PRESS SYS R+C (FLAPS 20)	VREF30+20	10380	240/-240	370/500	-620/2290	1030/-660	290/-300	680	0	4600
NAV AIR DATA SYS (FLAPS 20)	VREF20	7020	170/-170	250/350	-430/1650	460/-320	190/-200	460	1490	4540

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes max manual braking and maximum available reverse thrust.

*Altitude adjustment - Use STD up to 8000 ft pressure altitude, above 8000 ft,
Adjustment = $STD * 8 + HIGH * ((Press Alt / 1000) - 8)$.

**Unannunciated Non-Normal Checklist condition.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
Poor Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPEED ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	REF SPEED	370000 LB LDG WT	PER 10000 LB ABV/BLW 370000 LB	PER 1000 FT ABV S.L. STD/ HIGH*	HEAD/ TAIL WIND	DOWN/UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
NAV AIRSPEED DATA (FLAPS 20)	VREF20	7020	170/-170	250/350	-430/1650	460/-320	190/-200	460	1490	4540
OVERHEAT ENG L, R (FLAPS 20)	VREF20	8050	200/-200	290/390	-510/1940	730/-480	240/-240	550	0	3320
OVERHEAT ENG L, R (FLAPS 30)	VREF30	7700	190/-190	260/350	-500/1900	710/-460	220/-230	530	0	2770
PITCH UP AUTHORITY (FLAPS ≥ 20)	VREF30+20	7540	180/-180	280/380	-440/1690	480/-340	210/-220	440	1670	5080
PITCH UP AUTHORITY (FLAPS ≤ 15)	VREF30+40	8320	190/-190	310/420	-460/1730	490/-350	240/-250	420	1890	5750
PRI FLIGHT COMPUTERS (FLAPS 20)	VREF20	7310	180/-180	270/380	-450/1690	500/-350	200/-210	500	1680	5330
ROLL LEFT AUTHORITY (FLAPS 20)	VREF30+20	7530	180/-180	280/380	-440/1680	480/-340	210/-220	440	1670	5060
ROLL RIGHT AUTHORITY (FLAPS 20)	VREF30+20	7530	180/-180	280/380	-440/1680	480/-340	210/-220	440	1670	5060
SLATS DRIVE (FLAPS 20)	VREF30+30	8060	190/-190	300/410	-460/1730	500/-360	230/-240	440	1830	5570
SPOILER PAIRS (FLAPS 25)	VREF25+5	7140	180/-170	260/360	-440/1660	480/-340	200/-210	460	1580	4810
SPOILER PAIRS (FLAPS 30)	VREF30+5	7020	170/-170	250/340	-440/1660	490/-340	200/-200	460	1460	4290
STABILIZER (FLAPS 20)	VREF30+20	7540	180/-180	280/380	-440/1690	480/-340	210/-220	440	1670	5080

Actual (unfactored) distances are shown.
Includes distances from 50 ft above threshold (1000 ft air distance).
Assumes max manual braking and maximum available reverse thrust.

*Altitude adjustment - Use STD up to 8000 ft pressure altitude, above 8000 ft,
Adjustment = STD*8+HIGH*((Press Alt/1000)-8).

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Reference Brake Energy (Millions of Foot Pounds)

		BRAKES ON SPEED (KIAS)																	
		80			100			120			140			160			180		
WEIGHT (1000 LB)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)																	
		0	5	10	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
500	0	20.8	23.9	27.8	30.4	35.1	40.8	41.5	48.0	55.9	53.9	62.5	72.9	67.1	78.0	91.2	80.3	93.7	109.6
	10	21.5	24.7	28.7	31.5	36.3	42.3	42.9	49.7	57.9	55.7	64.7	75.5	69.3	80.7	94.3	82.9	96.8	113.4
	15	21.8	25.1	29.2	32.0	36.9	43.0	43.6	50.5	58.9	56.7	65.8	76.8	70.5	82.1	95.9	84.3	98.4	115.2
	20	22.1	25.5	29.6	32.5	37.5	43.7	44.4	51.3	59.8	57.6	66.8	78.0	71.6	83.4	97.5	85.6	99.9	117.0
	30	22.7	26.1	30.3	33.3	38.5	44.8	45.6	52.8	61.5	59.2	68.7	80.2	73.6	85.8	100.3	88.0	102.8	120.5
	40	23.0	26.5	30.8	34.0	39.2	45.6	46.5	53.8	62.7	60.5	70.2	82.0	75.3	87.8	102.7	90.2	105.4	123.5
460	0	19.4	22.4	26.0	28.4	32.7	38.1	38.6	44.7	52.0	50.1	58.0	67.7	62.4	72.5	84.7	74.9	87.3	102.2
	10	20.1	23.1	26.9	29.3	33.9	39.4	40.0	46.2	53.8	51.8	60.1	70.0	64.5	75.1	87.7	77.5	90.3	105.7
	15	20.4	23.5	27.3	29.8	34.4	40.0	40.6	47.0	54.7	52.7	61.1	71.2	65.6	76.3	89.2	78.7	91.8	107.4
	20	20.7	23.8	27.7	30.3	35.0	40.7	41.3	47.8	55.6	53.5	62.1	72.4	66.7	77.5	90.6	79.9	93.3	109.1
	30	21.2	24.4	28.3	31.1	35.9	41.7	42.4	49.1	57.2	55.0	63.8	74.5	68.5	79.8	93.2	82.2	95.9	112.3
	40	21.5	24.8	28.8	31.6	36.5	42.5	43.2	50.1	58.3	56.2	65.2	76.1	70.1	81.6	95.4	84.2	98.3	115.1
420	0	18.1	20.9	24.2	26.3	30.3	35.3	35.7	41.3	48.0	46.2	53.5	62.3	57.6	66.9	78.0	69.3	80.7	94.3
	10	18.7	21.5	25.0	27.2	31.4	36.5	37.0	42.7	49.7	47.8	55.4	64.5	59.6	69.2	80.8	71.7	83.5	97.6
	15	19.0	21.9	25.4	27.7	31.9	37.1	37.6	43.4	50.6	48.6	56.3	65.6	60.6	70.4	82.2	72.8	84.8	99.2
	20	19.3	22.2	25.8	28.1	32.4	37.7	38.2	44.1	51.4	49.4	57.2	66.7	61.5	71.5	83.5	74.0	86.2	100.8
	30	19.7	22.7	26.4	28.8	33.2	38.6	39.2	45.3	52.8	50.7	58.8	68.6	63.3	73.5	85.9	76.1	88.7	103.7
	40	20.0	23.0	26.8	29.3	33.8	39.3	40.0	46.2	53.8	51.8	60.0	70.0	64.7	75.2	87.8	77.9	90.8	106.3
380	0	16.8	19.3	22.5	24.3	27.9	32.5	32.8	37.8	44.0	42.2	48.8	56.9	52.6	61.0	71.1	63.4	73.7	86.1
	10	17.3	19.9	23.2	25.1	28.9	33.6	33.9	39.1	45.6	43.7	50.6	58.9	54.4	63.1	73.6	65.6	76.3	89.1
	15	17.6	20.3	23.5	25.5	29.4	34.1	34.5	39.8	46.3	44.4	51.4	59.9	55.3	64.2	74.9	66.7	77.5	90.6
	20	17.8	20.5	23.8	25.9	29.8	34.7	35.0	40.5	47.1	45.1	52.3	60.9	56.2	65.2	76.1	67.7	78.8	92.1
	30	18.2	21.0	24.4	26.5	30.6	35.5	35.9	41.5	48.3	46.4	53.7	62.6	57.8	67.1	78.3	69.6	81.0	94.7
	40	18.5	21.3	24.7	27.0	31.1	36.2	36.6	42.3	49.3	47.3	54.8	63.9	59.0	68.6	80.0	71.2	82.9	97.0
340	0	15.5	17.8	20.7	22.2	25.5	29.7	29.8	34.3	39.9	38.2	44.1	51.4	47.4	54.9	64.0	57.2	66.4	77.5
	10	16.0	18.4	21.3	22.9	26.4	30.7	30.8	35.5	41.3	39.5	45.7	53.2	49.1	56.9	66.3	59.2	68.7	80.2
	15	16.2	18.6	21.6	23.3	26.8	31.2	31.3	36.1	42.0	40.2	46.5	54.1	49.9	57.8	67.4	60.2	69.9	81.6
	20	16.4	18.9	21.9	23.6	27.2	31.6	31.8	36.7	42.7	40.8	47.2	55.0	50.7	58.8	68.5	61.1	71.0	82.9
	30	16.8	19.3	22.4	24.2	27.9	32.4	32.6	37.7	43.8	41.9	48.5	56.5	52.1	60.4	70.5	62.8	73.0	85.3
	40	17.0	19.6	22.7	24.6	28.4	33.0	33.2	38.4	44.6	42.7	49.5	57.6	53.2	61.7	72.0	64.2	74.7	87.2
300	0	14.2	16.3	18.9	20.1	23.1	26.8	26.7	30.8	35.8	34.1	39.3	45.8	42.1	48.7	56.7	50.7	58.8	68.5
	10	14.6	16.8	19.5	20.7	23.9	27.7	27.6	31.9	37.0	35.2	40.7	47.4	43.5	50.4	58.7	52.5	60.8	71.0
	15	14.8	17.0	19.8	21.1	24.2	28.2	28.1	32.4	37.7	35.8	41.4	48.2	44.3	51.3	59.7	53.3	61.9	72.2
	20	15.0	17.3	20.0	21.4	24.6	28.6	28.5	32.9	38.3	36.4	42.1	49.0	45.0	52.1	60.7	54.2	62.9	73.4
	30	15.3	17.6	20.5	21.9	25.2	29.3	29.2	33.7	39.2	37.4	43.2	50.3	46.2	53.5	62.4	55.7	64.6	75.4
	40	15.5	17.9	20.7	22.2	25.6	29.7	29.8	34.3	39.9	38.1	44.0	51.3	47.2	54.6	63.7	56.9	66.0	77.1

To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind.

If groundspeed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Event Adjusted Brake Energy (Millions of Foot Pounds)

No Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)												
EVENT		10	20	30	40	50	60	70	80	90	100	110	120	130
RTO MAX MAN		10	20	30	40	50	60	70	80	90	100	110	120	130
LANDING	MAX MAN	6.7	15.9	25.3	34.9	44.6	54.5	64.6	74.7	85.0	95.5	105.9	116.3	126.8
	MAX AUTO	6.1	14.6	23.1	31.8	40.8	50.0	59.5	69.4	79.8	90.6	101.6	112.6	123.7
	AUTOBRAKE 4	5.6	13.6	21.5	29.5	37.6	46.0	54.8	63.9	73.5	83.7	94.0	104.4	114.7
	AUTOBRAKE 3	5.4	12.9	20.3	27.7	35.1	42.8	50.8	59.1	68.0	77.6	87.3	97.0	106.7
	AUTOBRAKE 2	5.0	12.1	18.9	25.7	32.5	39.4	46.6	54.2	62.3	71.1	80.1	89.0	98.0
	AUTOBRAKE 1	4.2	10.6	16.7	22.8	28.9	35.1	41.5	48.3	55.5	63.3	71.2	79.2	87.1

2 Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)												
EVENT		10	20	30	40	50	60	70	80	90	100	110	120	130
RTO MAX MAN		10	20	30	40	50	60	70	80	90	100	110	120	130
LANDING	MAX MAN	6.2	14.5	23.0	31.8	40.8	49.8	58.9	68.1	77.3	86.3	95.4	104.4	113.5
	MAX AUTO	4.1	10.2	16.6	23.4	30.6	38.2	46.3	54.9	64.0	73.6	83.4	93.2	103.0
	AUTOBRAKE 4	2.2	6.5	11.1	16.2	21.7	27.7	34.2	41.3	49.1	57.5	66.2	74.8	83.4
	AUTOBRAKE 3	1.2	4.3	7.5	11.2	15.2	19.6	24.7	30.4	36.8	44.1	51.6	59.0	66.5
	AUTOBRAKE 2	0.6	2.9	5.2	7.7	10.5	13.7	17.4	21.7	26.7	32.5	38.6	44.7	50.8
	AUTOBRAKE 1	0.1	1.8	3.5	5.3	7.2	9.3	11.8	14.7	18.2	22.2	26.5	30.7	34.9

Cooling Time (Minutes)

		EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)									
		16 & BELOW	17	18	22	26	30	34	35	36 TO 44	45 & ABOVE
GEAR DOWN INFLIGHT	NO SPECIAL PROCEDURE	1	2	3	5	6	7	7	CAUTION	FUSE PLUG MELT ZONE	
GROUND	REQUIRED	12	18	35	49	60	72	73			
BRAKE TEMPERATURE INDICATION	UP TO 2.4	2.4	2.6	3.1	3.7	4.3	4.8	4.9	5.0 TO 6.2		6.3 & ABOVE

Observe maximum quick turnaround limit.

Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.

Add 1.0 million foot pounds for each taxi mile.

For one brake deactivated, increase brake energy by 13 percent.

For two brakes deactivated, increase brake energy by 25 percent.

When in caution zone, wheel fuse plugs may melt. Delay takeoff and inspect after one hour. If overheat occurs after takeoff, extend gear soon for at least 8 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not approach gear or attempt taxi for one hour. Tire, wheel and brake replacement may be required. If overheat occurs after takeoff, extend gear soon for at least 12 minutes.

Brake temperature indication on Multifunction Display may be used 10 to 15 minutes after airplane has come to a complete stop, or inflight with gear retracted, to determine recommended cooling schedule.

ADVISORY INFORMATION

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 30

Based on anti-ice off

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 LB)						
		AIRPORT PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
54	129	411.5	399.0					
52	126	421.7	409.3					
50	122	431.8	419.5	383.6				
48	118	441.3	429.6	393.5				
46	115	450.1	439.6	403.3	369.5			
44	111	458.7	449.0	413.1	378.9			
42	108	467.5	457.6	422.6	388.4	352.1		
40	104	481.4	466.1	431.5	397.5	361.1		
38	100	492.9	478.3	439.8	406.6	369.8	339.8	
36	97	501.7	491.8	448.1	415.0	378.5	348.2	
34	93	510.5	500.4	456.0	422.6	387.0	356.4	320.6
32	90	510.8	508.8	463.9	430.1	394.7	364.5	328.6
30	86	511.0	517.2	472.2	437.4	401.7	372.6	336.3
28	82	511.2	517.4	487.5	444.6	408.7	379.9	344.0
26	79	511.4	517.5	494.8	451.5	416.0	386.7	351.6
24	75	511.5	517.7	495.0	458.4	423.2	393.3	358.4
22	72	511.7	517.8	495.1	464.7	430.2	399.7	364.8
20	68	511.9	518.0	495.3	464.9	436.6	405.9	370.9
18	64	512.1	518.1	495.5	465.0	442.6	411.4	376.1
16	61	512.3	518.3	495.6	465.2	442.8	416.3	381.3
14	57	512.5	518.5	495.8	465.3	442.9	420.7	386.2
12	54	512.7	518.7	495.9	465.4	443.0	420.7	390.4
10	50	512.9	518.8	496.1	465.6	443.2	420.8	394.1
-40	-40	517.9	523.3	500.1	469.3	446.3	423.1	396.4

With engine anti-ice on, decrease weight by 1100 lb.

With engine and wing anti-ice on, decrease weight by 1100 lb.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 37500 lb.

ADVISORY INFORMATION

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 25

Based on anti-ice off

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 LB)						
		AIRPORT PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
54	129	413.7	401.2					
52	126	423.9	411.5					
50	122	434.1	421.8	385.7				
48	118	443.7	431.9	395.6				
46	115	452.5	442.0	405.5	371.5			
44	111	461.2	451.5	415.3	381.0			
42	108	470.2	460.0	424.9	390.5	354.0		
40	104	487.6	468.7	433.8	399.7	363.0		
38	100	496.4	486.2	442.0	408.7	371.8	341.6	
36	97	505.3	494.9	450.1	417.0	380.5	350.0	
34	93	514.1	503.4	458.1	424.6	389.1	358.4	322.3
32	90	514.4	512.0	466.1	432.2	396.8	366.5	330.3
30	86	514.6	520.4	475.6	439.6	403.9	374.6	338.1
28	82	514.8	520.6	490.5	446.9	410.9	382.0	345.9
26	79	514.9	520.7	497.9	453.9	418.2	388.8	353.5
24	75	515.1	520.9	498.1	460.7	425.5	395.4	360.4
22	72	515.3	521.1	498.2	467.3	432.5	402.0	366.8
20	68	515.4	521.2	498.4	467.5	439.1	408.2	373.0
18	64	515.6	521.4	498.5	467.7	445.3	413.8	378.3
16	61	515.8	521.5	498.7	467.8	445.4	418.8	383.6
14	57	516.1	521.7	498.8	467.9	445.5	423.2	388.5
12	54	516.3	521.9	499.0	468.1	445.6	423.3	392.8
10	50	516.5	522.1	499.2	468.2	445.8	423.4	396.5
-40	-40	521.4	526.6	503.3	472.0	449.0	425.6	398.8

With engine anti-ice on, decrease weight by 400 lb.

With engine and wing anti-ice on, decrease weight by 400 lb.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 39800 lb.

ADVISORY INFORMATION

Fuel Heating Schedule

		TO BE SUPPLIED					

Intentionally
Blank

Performance Inflight - QRH

Engine Inoperative

Chapter PI-QRH

Section 12

ENGINE INOP

Initial Max Continuous TPR

Based on .85M and anti-ice on or off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20	76.7	77.0	77.2	77.0	76.2	73.6	72.3	71.5	70.7
15	80.7	81.1	81.3	81.5	80.4	77.9	76.7	75.9	75.2
10	84.9	85.3	85.5	85.7	84.7	82.2	81.1	80.4	79.6
5	87.7	89.6	90.0	89.9	89.1	86.6	85.7	84.9	84.2
0	87.9	92.0	94.2	94.7	93.5	91.1	90.3	89.6	88.8
-5	88.1	92.2	96.1	98.6	97.6	95.4	94.8	94.1	93.4
-10	88.3	92.5	96.4	100.0	101.9	99.9	99.5	99.2	98.8
-15	88.5	92.7	96.6	100.2	103.2	103.6	103.6	103.7	103.8
-20	88.7	92.9	96.8	100.5	103.4	103.9	103.8	103.9	104.1
-25	88.9	93.1	97.0	100.7	103.7	104.1	104.1	104.2	104.3
-30	89.1	93.3	97.3	100.9	103.9	104.4	104.3	104.4	104.6
-35	89.3	93.6	97.5	101.2	104.2	104.6	104.5	104.7	104.8
-40	89.5	93.8	97.7	101.4	104.4	104.9	104.8	104.9	105.0

ENGINE INOP

Max Continuous TPR
Based on anti-ice on or off
37000 FT to 27000 FT Pressure Altitudes

37000 FT PRESS ALT													TAT (°C)
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.86	104.8	104.5	104.3	104.0	103.8	103.6	103.3	103.1	99.8	95.4	91.1	86.5
240	0.74	105.5	105.3	105.0	104.8	104.5	104.3	102.9	98.5	94.1	89.4	84.6	80.1
200	0.63	105.9	105.7	105.4	105.1	104.9	102.0	97.7	93.0	88.0	83.2	78.5	74.9
35000 FT PRESS ALT													TAT (°C)
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.82	104.9	104.6	104.4	104.2	103.9	103.7	103.4	103.2	100.1	95.9	91.6	87.2
240	0.71	105.5	105.2	104.9	104.7	104.4	104.2	103.1	98.8	94.5	89.8	85.2	80.7
200	0.60	105.9	105.6	105.4	105.1	104.8	102.7	98.6	94.0	89.0	84.1	79.5	75.3
33000 FT PRESS ALT													TAT (°C)
CIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
320	0.89	98.3	98.1	97.9	97.6	97.4	97.2	97.0	96.7	96.5	96.3	93.3	89.1
280	0.79	103.0	102.7	102.5	102.2	102.0	101.8	101.5	101.3	100.0	96.0	91.5	87.0
240	0.68	103.7	103.4	103.2	102.9	102.7	102.4	102.2	99.0	94.6	90.2	85.6	81.0
200	0.58	104.5	104.2	103.9	103.7	103.4	103.2	98.8	94.3	89.6	84.9	80.3	75.7
31000 FT PRESS ALT													TAT (°C)
CIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
320	0.85	97.5	97.3	97.0	96.8	96.6	96.4	96.1	95.9	95.7	94.0	89.8	85.4
280	0.76	100.6	100.4	100.1	99.9	99.7	99.4	99.2	98.9	95.4	91.2	86.8	82.2
240	0.66	101.4	101.1	100.9	100.6	100.4	100.1	99.1	94.8	90.5	85.8	81.0	76.3
200	0.55	102.0	101.7	101.5	101.2	100.9	99.1	94.8	90.3	85.4	80.6	75.9	71.3
29000 FT PRESS ALT													TAT (°C)
CIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
320	0.82	96.4	96.1	95.9	95.7	95.5	95.2	95.0	94.8	94.6	89.9	85.6	81.4
280	0.73	99.5	99.2	99.0	98.7	98.5	98.3	98.0	95.9	91.2	86.9	82.4	77.9
240	0.63	100.7	100.4	100.2	99.9	99.7	99.4	95.9	91.2	86.7	82.0	77.2	72.2
200	0.53	101.2	100.9	100.7	100.4	100.2	96.0	91.3	86.6	81.8	77.0	72.3	69.6
27000 FT PRESS ALT													TAT (°C)
CIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
360	0.88	86.5	86.3	86.1	85.9	85.7	85.5	85.3	85.1	84.9	84.7	84.1	79.9
320	0.79	97.8	97.5	97.3	97.1	96.8	96.6	96.4	96.2	95.9	91.7	85.8	81.6
280	0.70	100.3	100.1	99.8	99.6	99.3	99.1	98.9	98.6	93.0	88.3	83.9	79.5
240	0.60	102.1	101.8	101.6	101.3	101.1	100.8	99.7	92.6	88.1	83.5	79.0	74.0
200	0.51	102.4	102.1	101.8	101.6	101.3	99.8	92.8	88.4	83.6	78.8	74.1	69.3

ENGINE INOP

Max Continuous TPR

Based on anti-ice on or off

25000 FT to 18000 FT Pressure Altitudes

25000 FT PRESS ALT			TAT (°C)											
CIAS	M		-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.85	85.3	85.1	84.9	84.7	84.5	84.3	84.1	83.9	83.7	83.5	83.3	83.1	76.2
320	0.76	96.5	96.3	96.0	95.8	95.6	95.3	95.1	94.9	93.6	86.4	82.1	78.1	
280	0.67	99.6	99.4	99.2	98.9	98.7	98.4	98.2	95.3	89.3	84.9	80.6	76.2	
240	0.58	101.4	101.2	100.9	100.7	100.4	100.2	95.8	89.7	85.2	80.7	76.1	71.1	
200	0.49	100.7	100.5	100.2	100.0	99.7	95.5	89.5	85.0	80.4	75.7	70.9	67.4	
24000 FT PRESS ALT			TAT (°C)											
CIAS	M		-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.83	86.4	86.2	86.0	85.8	85.6	85.4	85.2	85.0	84.8	84.6	81.6	76.9	
320	0.75	95.4	95.2	95.0	94.8	94.5	94.3	94.1	93.9	93.6	87.5	82.8	78.7	
280	0.66	98.8	98.6	98.3	98.1	97.8	97.6	97.4	96.2	89.9	85.6	81.3	77.0	
240	0.57	100.1	99.8	99.6	99.3	99.1	98.8	96.8	90.3	85.9	81.4	77.0	72.0	
200	0.48	98.8	98.6	98.3	98.1	97.8	96.2	89.9	85.4	80.9	76.3	71.6	67.0	
22000 FT PRESS ALT			TAT (°C)											
CIAS	M		-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.80	88.7	88.5	88.2	88.0	87.8	87.6	87.4	87.2	87.0	85.8	79.5	75.6	
320	0.72	93.5	93.2	93.0	92.8	92.6	92.3	92.1	91.9	89.4	84.5	80.4	76.4	
280	0.63	97.3	97.0	96.8	96.5	96.3	96.1	95.8	92.2	87.4	83.2	78.9	74.4	
240	0.55	96.4	96.2	95.9	95.7	95.5	95.2	91.5	86.7	82.3	78.0	73.4	68.6	
200	0.46	95.0	94.7	94.5	94.3	94.0	91.0	86.2	81.8	77.4	72.9	68.4	65.4	
20000 FT PRESS ALT			TAT (°C)											
CIAS	M		-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.77	87.2	87.0	86.8	86.6	86.3	86.1	85.9	85.7	85.5	85.3	82.2	78.3	
320	0.69	92.0	91.8	91.5	91.3	91.1	90.9	90.6	90.4	90.2	86.4	82.4	78.4	
280	0.61	95.8	95.6	95.3	95.1	94.8	94.6	94.4	93.8	90.0	85.9	81.7	77.4	
240	0.53	95.2	95.0	94.7	94.5	94.2	94.0	93.4	88.6	84.2	80.0	75.7	70.9	
200	0.44	95.8	95.5	95.3	95.0	94.8	94.5	89.7	85.3	80.9	76.5	71.7	66.8	
18000 FT PRESS ALT			TAT (°C)											
CIAS	M		-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.75	84.1	83.9	83.7	83.5	83.3	83.1	82.9	82.7	82.5	81.5	78.1	74.4	
320	0.67	89.8	89.5	89.3	89.1	88.9	88.7	88.4	88.2	86.2	82.2	78.2	74.4	
280	0.59	92.9	92.7	92.4	92.2	92.0	91.7	91.5	89.5	85.7	81.6	77.5	73.3	
240	0.51	92.0	91.8	91.5	91.3	91.1	90.8	89.1	85.1	80.9	76.8	72.5	67.6	
200	0.42	94.3	94.1	93.9	93.6	93.4	92.0	87.5	83.2	78.9	74.5	69.6	64.8	

ENGINE INOP

Max Continuous TPR
Based on anti-ice on or off
16000 FT to 5000 FT Pressure Altitudes

16000 FT PRESS ALT													TAT (°C)	
KLAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	
360	0.72	81.5	81.3	81.1	80.9	80.7	80.5	80.3	80.1	79.9	79.7	76.9	73.6	
320	0.64	87.6	87.4	87.1	86.9	86.7	86.5	86.3	86.1	85.9	82.1	78.1	74.4	
280	0.57	90.3	90.0	89.8	89.6	89.4	89.1	88.9	88.7	84.7	80.6	76.6	72.7	
240	0.49	91.3	91.0	90.8	90.6	90.3	90.1	89.9	85.9	81.6	77.5	73.5	69.0	
200	0.41	93.3	93.0	92.8	92.6	92.3	92.1	88.9	84.2	80.0	75.8	71.4	66.5	
14000 FT PRESS ALT													TAT (°C)	
KLAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35	
360	0.69	79.5	79.3	79.1	78.9	78.7	78.5	78.3	78.2	78.0	76.9	74.0	70.6	
320	0.62	84.9	84.7	84.5	84.3	84.1	83.9	83.7	83.5	81.8	77.9	74.2	70.6	
280	0.54	88.0	87.8	87.6	87.3	87.1	86.9	86.7	84.8	80.2	76.3	72.5	68.7	
240	0.47	90.2	89.9	89.7	89.5	89.3	89.0	87.8	82.3	78.3	74.4	70.5	65.8	
200	0.39	92.1	91.9	91.7	91.4	91.2	90.9	85.5	81.2	77.1	73.0	68.4	63.7	
12000 FT PRESS ALT													TAT (°C)	
KLAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40	
360	0.67	75.4	75.2	75.0	74.8	74.7	74.5	74.3	74.1	73.9	72.8	70.2	67.0	
320	0.60	82.7	82.5	82.3	82.1	81.9	81.7	81.5	81.2	77.8	74.0	70.5	67.0	
280	0.52	86.2	86.0	85.8	85.6	85.4	85.1	84.9	80.8	76.4	72.7	69.1	65.0	
240	0.45	89.1	88.9	88.6	88.4	88.2	87.9	84.4	79.1	75.2	71.4	67.4	62.9	
200	0.38	91.4	91.1	90.9	90.7	90.4	88.8	82.3	78.3	74.4	70.3	65.7	61.2	
10000 FT PRESS ALT													TAT (°C)	
KLAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40	
360	0.65	71.7	71.5	71.4	71.2	71.0	70.8	70.7	70.5	70.3	69.5	67.3	65.3	
320	0.58	79.4	79.2	79.0	78.8	78.6	78.4	78.2	78.0	76.7	72.7	69.2	65.8	
280	0.51	82.5	82.3	82.1	81.9	81.7	81.5	81.3	80.6	76.6	72.9	69.4	65.9	
240	0.43	85.2	85.0	84.8	84.6	84.4	84.1	83.9	80.3	76.4	72.7	69.0	64.8	
200	0.36	86.9	86.7	86.5	86.3	86.0	85.8	83.9	80.2	76.3	72.4	68.3	63.7	
5000 FT PRESS ALT													TAT (°C)	
KLAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45	
360	0.59	64.9	64.8	64.6	64.5	64.3	64.1	64.0	63.8	63.7	63.5	62.3	60.1	
320	0.53	71.8	71.6	71.4	71.3	71.1	70.9	70.7	70.5	70.4	67.8	64.7	61.7	
280	0.46	76.4	76.2	76.0	75.8	75.6	75.4	75.2	75.0	72.7	68.9	65.6	62.3	
240	0.40	79.2	79.0	78.8	78.6	78.4	78.2	78.0	77.1	72.9	69.4	66.0	62.6	
200	0.33	80.9	80.7	80.5	80.3	80.1	79.9	79.6	76.7	72.9	69.4	66.0	62.0	

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

Includes APU fuel burn

WEIGHT (1000 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
500	482	266	19100	17600	15500
480	463	261	20300	18900	17000
460	444	255	21500	20100	18400
440	425	250	22700	21100	19700
420	406	245	24000	22200	20800
400	388	239	25500	23400	21900
380	369	234	26600	24800	23300
360	349	227	27600	26200	24800
340	330	221	28800	27600	26400
320	310	214	30000	29000	27900
300	290	208	31600	30600	29400
280	271	201	33300	32300	31200
260	252	195	34900	34100	33000
240	233	188	36500	35900	35000

ENGINE INOP

MAX CONTINUOUS THRUST

**Driftdown/LRC Cruise Range Capability
Ground to Air Miles Conversion**

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
136	127	119	112	105	100	94	90	86	82	78
273	255	238	224	211	200	189	180	172	164	157
411	382	358	336	317	300	284	270	258	246	236
548	510	477	448	422	400	379	360	344	328	314
686	638	597	560	528	500	474	451	430	410	393
823	766	716	673	634	600	569	541	515	492	471
961	894	836	785	740	700	663	631	601	574	550
1099	1022	956	897	846	800	758	721	687	656	628
1236	1150	1075	1010	951	900	853	811	773	738	707
1374	1278	1195	1122	1057	1000	948	901	859	820	785
1512	1407	1315	1234	1163	1100	1043	991	945	902	864
1650	1535	1435	1347	1269	1200	1137	1081	1031	984	942
1788	1663	1554	1459	1375	1300	1232	1171	1116	1066	1021
1926	1791	1674	1571	1480	1400	1327	1262	1202	1148	1099
2064	1919	1794	1684	1586	1500	1422	1352	1288	1230	1177
2202	2048	1914	1796	1692	1600	1517	1442	1374	1312	1256
2340	2176	2033	1908	1798	1700	1611	1532	1460	1394	1334
2477	2304	2153	2021	1904	1800	1706	1622	1546	1476	1413

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 LB)								TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 LB)								
	220	260	300	340	380	420	460	500	
100	1.4	1.4	1.5	1.6	1.7	1.8	2.0	2.1	0:16
200	3.0	3.2	3.5	3.7	4.0	4.4	4.8	5.1	0:32
300	4.7	5.2	5.7	6.1	6.7	7.3	7.9	8.5	0:49
400	6.5	7.3	7.9	8.6	9.5	10.4	11.2	12.1	1:05
500	8.1	9.1	10.2	11.1	12.3	13.5	14.6	15.7	1:21
600	9.7	11.0	12.3	13.5	14.9	16.5	17.9	19.3	1:38
700	11.2	12.8	14.4	15.8	17.5	19.3	21.0	22.6	1:54
800	12.8	14.6	16.4	18.1	20.0	22.1	24.0	25.9	2:11
900	14.4	16.4	18.5	20.4	22.5	24.9	27.0	29.1	2:27
1000	15.9	18.2	20.5	22.6	25.0	27.6	30.0	32.4	2:44
1100	17.4	20.0	22.5	24.9	27.5	30.3	33.0	35.6	3:00
1200	18.9	21.7	24.5	27.1	30.0	33.1	35.9	38.8	3:17
1300	20.5	23.5	26.5	29.3	32.5	35.8	38.9	41.9	3:33
1400	22.0	25.2	28.4	31.5	34.9	38.4	41.8	45.1	3:50
1500	23.4	26.9	30.4	33.7	37.3	41.1	44.7	48.2	4:06
1600	24.9	28.6	32.3	35.9	39.7	43.8	47.6	51.4	4:23
1700	26.4	30.3	34.3	38.1	42.1	46.4	50.4	54.5	4:39
1800	27.9	32.0	36.2	40.2	44.5	49.0	53.3	57.6	4:55

Includes APU fuel burn.

Driftdown at optimum driftdown speed and cruise at Long Range Cruise speed.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
500	16800	14200	9300
480	18300	16300	12200
460	19700	18300	14800
440	21000	19800	17500
420	22300	21000	19400
400	23700	22100	20800
380	25100	23300	21900
360	26400	24500	23200
340	27500	25900	24500
320	28600	27300	26000
300	29900	28800	27600
280	31600	30500	29300
260	33400	32400	31100
240	35200	34400	33200
220	36900	36200	35300

With anti-ice on, no altitude capability adjustment is required.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
500	TPR	67.5	77.2	82.5							
	MACH	.552	.586	.604							
	KIAS	306	296	294							
	FF/ENG	12847	12566	12643							
460	TPR	63.6	72.8	76.9	82.2	89.1					
	MACH	.535	.573	.585	.603	.630					
	KIAS	297	290	285	283	284					
	FF/ENG	11865	11648	11521	11595	11998					
420	TPR	59.7	68.2	72.2	76.2	81.6	88.5				
	MACH	.517	.556	.572	.584	.602	.627				
	KIAS	287	281	278	273	271	271				
	FF/ENG	10896	10692	10622	10486	10541	10890				
380	TPR	55.5	63.5	67.1	71.1	75.1	80.3	86.8			
	MACH	.496	.536	.553	.569	.581	.598	.623			
	KIAS	275	271	268	266	261	258	258			
	FF/ENG	9893	9724	9647	9601	9468	9485	9733			
340	TPR	51.0	58.8	62.0	65.6	69.5	73.6	78.3	84.8		
	MACH	.473	.515	.531	.547	.564	.577	.592	.615		
	KIAS	261	259	257	255	253	249	245	244		
	FF/ENG	8879	8772	8687	8611	8570	8471	8421	8607		
300	TPR	46.5	53.6	56.8	60.0	63.5	67.3	71.4	75.9	81.9	90.0
	MACH	.446	.488	.505	.522	.539	.556	.572	.585	.605	.634
	KIAS	247	246	245	243	241	239	236	232	230	231
	FF/ENG	7872	7774	7734	7667	7598	7554	7490	7410	7496	7831
260	TPR	41.8	48.1	51.1	54.2	57.5	60.8	64.4	68.5	72.8	78.0
	MACH	.418	.458	.475	.492	.510	.527	.544	.562	.576	.592
	KIAS	231	230	230	229	228	226	224	222	219	215
	FF/ENG	6877	6772	6747	6711	6668	6609	6548	6509	6443	6427
220	TPR	37.1	42.5	45.1	47.9	50.8	54.0	57.3	60.7	64.6	68.9
	MACH	.387	.424	.440	.457	.475	.493	.511	.529	.546	.565
	KIAS	213	213	212	212	212	211	210	208	207	205
	FF/ENG	5900	5776	5809	5787	5701	5663	5626	5574	5527	5498

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
289	266	245	228	213	200	191	182	174	167	161
582	535	493	458	427	400	381	363	347	332	319
877	805	741	687	641	600	571	544	519	497	477
1173	1076	990	917	855	800	761	725	692	661	634
1470	1347	1239	1148	1070	1000	951	905	864	826	792
1768	1619	1488	1378	1284	1200	1141	1086	1035	990	949
2067	1892	1738	1609	1499	1400	1330	1266	1207	1154	1106
2367	2166	1989	1840	1713	1600	1520	1446	1379	1318	1263
2669	2441	2240	2072	1928	1800	1709	1626	1550	1481	1419

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	6.1	0:40	5.4	0:38	4.9	0:37	4.4	0:35	4.1	0:33
400	12.5	1:19	11.5	1:15	10.5	1:11	9.8	1:09	9.4	1:05
600	18.8	1:57	17.4	1:51	16.1	1:46	15.1	1:43	14.5	1:37
800	25.1	2:36	23.3	2:28	21.7	2:22	20.3	2:17	19.7	2:09
1000	31.4	3:15	29.2	3:05	27.2	2:57	25.6	2:51	24.7	2:42
1200	37.6	3:55	35.0	3:43	32.7	3:33	30.7	3:25	29.7	3:14
1400	43.7	4:35	40.8	4:20	38.1	4:09	35.8	4:00	34.6	3:47
1600	49.8	5:15	46.5	4:58	43.5	4:45	40.9	4:34	39.5	4:20
1800	55.8	5:55	52.2	5:36	48.8	5:21	46.0	5:09	44.3	4:54

Fuel Required Adjustment (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)							
	220	260	300	340	380	420	460	500
5	-0.8	-0.6	-0.4	-0.2	0.0	0.4	0.7	1.1
10	-1.9	-1.4	-0.9	-0.5	0.0	0.9	1.9	2.8
15	-2.9	-2.2	-1.4	-0.7	0.0	1.5	3.1	4.6
20	-4.0	-3.0	-2.0	-1.0	0.0	2.0	4.2	6.3
25	-5.0	-3.8	-2.5	-1.2	0.0	2.5	5.3	8.0
30	-6.1	-4.6	-3.0	-1.5	0.0	3.0	6.4	9.7
35	-7.2	-5.4	-3.5	-1.8	0.0	3.5	7.4	11.3
40	-8.2	-6.1	-4.1	-2.0	0.0	4.0	8.5	12.9
45	-9.3	-6.9	-4.6	-2.3	0.0	4.5	9.5	14.5
50	-10.3	-7.7	-5.1	-2.6	0.0	4.9	10.5	16.1
55	-11.4	-8.5	-5.6	-2.8	0.0	5.4	11.5	17.7
60	-12.5	-9.3	-6.2	-3.1	0.0	5.8	12.4	19.3

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
500	TPR	48.6	53.8	62.6	73.8	90.0		
	KIAS	244	249	259	266	269		
	FF/ENG	11520	11540	11710	12010	12820		
460	TPR	45.4	50.3	58.3	68.7	82.1		
	KIAS	236	237	244	256	258		
	FF/ENG	10600	10560	10630	10910	11330		
420	TPR	42.3	46.6	54.1	63.4	75.3	93.2	
	KIAS	229	230	230	239	245	247	
	FF/ENG	9720	9660	9630	9790	10070	10860	
380	TPR	39.1	43.1	49.9	58.2	69.0	83.1	
	KIAS	222	222	223	223	233	235	
	FF/ENG	8850	8770	8720	8730	8950	9320	
340	TPR	36.0	39.5	45.7	53.2	62.7	74.6	
	KIAS	214	215	215	215	216	221	
	FF/ENG	7990	7920	7840	7820	7890	8050	
300	TPR	32.8	36.0	41.5	48.2	56.7	67.0	81.7
	KIAS	206	206	206	207	207	208	209
	FF/ENG	7170	7080	6990	6940	7000	6980	7300
260	TPR	29.8	32.6	37.5	43.4	50.8	59.8	71.6
	KIAS	198	198	198	198	198	198	198
	FF/ENG	6400	6290	6190	6110	6150	6080	6170
220	TPR	26.6	29.1	33.4	38.7	45.2	52.9	63.0
	KIAS	188	188	188	188	188	188	188
	FF/ENG	5630	5520	5400	5360	5400	5240	5260

This table includes 5% additional fuel for holding in a racetrack pattern.

ENGINE INOP

ADVISORY INFORMATION

Gear Down Landing Rate of Climb Available Flaps 20

TAT (°C)	RATE OF CLIMB (FT/MIN)						
	PRESSURE ALTITUDE (FT)						
	-2000	0	2000	4000	6000	8000	10000
52	230	190					
50	260	230	90				
48	300	270	130	-10			
46	340	310	170	30			
44	370	340	210	70			
42	410	380	240	110	-50		
40	440	420	280	150	-10		
38	480	460	320	180	30	-100	
36	500	490	350	210	60	-70	
34	510	530	390	250	100	-30	-200
32	510	550	420	280	130	0	-160
30	510	550	450	310	160	30	-130
20	520	560	480	390	290	170	10
10	540	580	490	390	300	190	70
0	550	590	500	410	300	200	70
-20	580	620	530	430	320	210	80
-40	620	660	560	450	340	230	90

Rate of climb capability shown is valid for 370000 lb, gear down at VREF20+5.

Decrease rate of climb 40 ft/min per 10000 lb greater than 370000 lb.

Increase rate of climb 60 ft/min per 10000 lb less than 370000 lb.

Flaps 30

TAT (°C)	RATE OF CLIMB (FT/MIN)						
	PRESSURE ALTITUDE (FT)						
	-2000	0	2000	4000	6000	8000	10000
52	50	0					
50	80	40	-100				
48	120	80	-60	-200			
46	150	120	-20	-160			
44	190	160	20	-120			
42	220	190	50	-80	-240		
40	260	230	90	-50	-200		
38	290	260	120	-10	-170	-300	
36	320	300	160	20	-130	-260	
34	320	340	190	50	-100	-230	-390
32	320	360	220	80	-70	-200	-360
30	320	360	250	110	-40	-170	-330
20	330	370	270	180	80	-40	-200
10	340	380	280	190	90	-10	-140
0	350	390	290	200	90	-10	-140
-20	370	410	310	210	100	-10	-140
-40	400	440	330	220	110	0	-140

Rate of climb capability shown is valid for 370000 lb, gear down at VREF30+5.

Decrease rate of climb 40 ft/min per 10000 lb greater than 370000 lb.

Increase rate of climb 60 ft/min per 10000 lb less than 370000 lb.

Intentionally
Blank

Performance Inflight - QRH
Gear Down

Chapter PI-QRH
Section 13

GEAR DOWN

220 KIAS Max Climb TPR

TAT (°C)	PRESSURE ALTITUDE (1000 FT)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
55	51.4	52.4	55.9	56.2	53.3	50.2	62.1	63.3	64.0	65.4	67.0	68.1	69.2	71.8	74.5
50	54.6	54.7	55.9	56.2	57.3	54.1	62.1	63.3	64.0	65.4	67.0	68.1	69.2	71.8	74.5
45	58.3	58.1	55.9	56.2	58.3	58.0	62.1	63.3	64.0	65.4	67.0	68.1	69.2	71.8	74.5
40	61.7	62.0	59.8	57.6	58.3	60.2	62.1	63.3	64.0	65.4	67.0	68.1	69.2	71.8	74.5
35	65.1	66.1	63.7	62.0	61.1	60.3	62.1	63.3	64.0	65.4	67.0	68.1	69.2	71.8	74.5
30	68.0	69.8	68.1	66.3	65.3	64.5	63.8	63.3	64.0	65.4	67.0	68.1	69.2	71.8	74.5
25	68.2	74.1	72.5	70.5	69.6	68.7	68.1	66.6	64.6	65.4	67.0	68.1	69.2	71.8	74.5
20	68.4	76.4	76.3	74.6	73.9	73.1	72.4	70.9	68.9	68.0	67.0	68.1	69.2	71.8	74.5
15	68.6	76.6	80.7	78.6	78.1	77.6	76.9	75.3	73.1	72.4	71.6	70.1	69.2	71.8	74.5
10	68.8	76.8	81.7	82.7	82.2	81.7	81.3	79.8	77.4	77.0	76.4	74.8	73.3	73.4	74.5
5	68.9	77.0	81.9	82.9	84.5	85.8	85.6	84.2	81.7	81.3	81.3	79.6	78.0	78.0	78.3
0	69.1	77.2	82.2	83.1	84.7	86.8	89.5	88.8	86.2	86.2	86.3	84.6	83.0	82.6	82.8
-5	69.3	77.4	82.4	83.3	85.0	87.1	89.7	91.3	91.0	90.7	90.9	89.6	88.1	87.5	87.3
-10	69.5	77.6	82.6	83.5	85.2	87.3	89.9	91.6	91.9	94.2	95.2	94.0	92.7	92.4	92.0
-15	69.7	77.8	82.8	83.7	85.4	87.5	90.1	91.8	92.1	94.5	97.0	98.1	97.0	96.7	96.4
-20	69.8	78.0	83.0	84.0	85.6	87.8	90.4	92.0	92.3	94.7	97.2	98.3	99.4	101.1	100.9

Long Range Cruise Altitude Capability

Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
500	17800	16000	13900
480	18900	17200	15300
460	19900	18400	16500
440	20900	19500	17900
420	21900	20600	19100
400	23100	21600	20300
380	24400	22900	21300
360	25800	24400	22600
340	27000	26000	24300
320	28200	27200	26100
300	29400	28500	27400
280	30800	29800	28800
260	32300	31300	30200
240	33800	32800	31800
220	35300	34500	33500

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
500	TPR	58.9	70.6	76.6							
	MACH	.439	.488	.511							
	KIAS	243	246	247							
	FF/ENG	10157	10508	10784							
460	TPR	55.6	66.0	71.4	77.5						
	MACH	.430	.474	.496	.518						
	KIAS	237	238	240	241						
	FF/ENG	9457	9658	9850	10115						
420	TPR	52.0	61.4	66.0	71.1	76.8					
	MACH	.417	.459	.478	.498	.518					
	KIAS	230	231	231	231	232					
	FF/ENG	8694	8842	8933	9037	9198					
380	TPR	48.4	57.1	61.2	65.8	70.9	76.6	83.3			
	MACH	.403	.445	.463	.482	.501	.522	.543			
	KIAS	223	223	223	224	224	224	224			
	FF/ENG	7954	8064	8150	8221	8304	8448	8670			
340	TPR	44.8	52.7	56.5	60.6	65.2	70.3	75.8	82.8		
	MACH	.389	.429	.446	.465	.484	.504	.525	.547		
	KIAS	215	215	215	216	216	216	216	216		
	FF/ENG	7232	7304	7385	7453	7488	7558	7660	7907		
300	TPR	41.1	48.4	51.8	55.6	59.6	64.0	69.0	74.6	81.6	
	MACH	.374	.412	.429	.447	.465	.484	.505	.526	.548	
	KIAS	206	207	207	207	207	207	207	207	207	
	FF/ENG	6529	6563	6638	6703	6723	6738	6790	6899	7113	
260	TPR	37.6	44.1	47.2	50.5	54.1	58.0	62.3	67.3	72.8	79.6
	MACH	.359	.395	.411	.428	.445	.464	.483	.504	.525	.548
	KIAS	198	198	198	198	198	198	198	198	198	198
	FF/ENG	5855	5855	5928	5979	5983	5975	5992	6049	6140	6312
220	TPR	34.1	39.8	42.6	45.6	48.7	52.1	55.9	60.2	65.1	70.4
	MACH	.342	.376	.391	.407	.424	.442	.460	.480	.501	.522
	KIAS	188	188	188	188	188	188	188	188	188	188
	FF/ENG	5183	5199	5228	5305	5280	5243	5243	5274	5317	5389

GEAR DOWN

Long Range Cruise Enroute Fuel and Time
Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
335	297	264	239	218	200	188	176	166	157	149
677	599	532	479	437	400	374	351	330	312	296
1022	902	800	720	656	600	561	525	494	466	442
1369	1207	1069	962	875	800	747	700	658	620	588
1718	1514	1340	1204	1095	1000	934	874	821	774	734
2070	1822	1611	1446	1314	1200	1120	1048	984	928	879
2426	2132	1883	1690	1534	1400	1306	1222	1147	1081	1024
2786	2446	2158	1934	1755	1600	1493	1396	1309	1234	1169
3150	2762	2433	2179	1976	1800	1679	1569	1472	1386	1313
3518	3081	2710	2424	2196	2000	1864	1742	1633	1538	1457
3890	3402	2988	2671	2418	2200	2050	1915	1795	1690	1601
4266	3725	3268	2918	2640	2400	2235	2088	1957	1842	1745
4647	4052	3550	3166	2862	2600	2421	2260	2118	1994	1888
5034	4383	3834	3415	3084	2800	2607	2434	2280	2145	2031
5426	4717	4120	3665	3307	3000	2793	2606	2441	2296	2173
5823	5054	4407	3916	3531	3200	2978	2778	2601	2447	2316
6227	5396	4697	4169	3755	3400	3163	2950	2762	2598	2458
6636	5741	4990	4423	3979	3600	3348	3123	2923	2748	2600
7053	6090	5284	4677	4204	3800	3533	3294	3083	2898	2741
7477	6444	5580	4932	4430	4000	3718	3465	3242	3047	2882

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	11.5	0:52	10.6	0:50	9.6	0:48	8.7	0:47	8.0	0:45
400	23.3	1:42	21.7	1:39	20.0	1:35	18.3	1:32	17.0	1:29
600	35.1	2:32	32.8	2:28	30.4	2:22	27.9	2:18	26.1	2:12
800	46.4	3:23	43.5	3:18	40.4	3:10	37.2	3:05	34.8	2:57
1000	57.8	4:14	54.2	4:07	50.5	3:58	46.5	3:51	43.5	3:42
1200	68.7	5:07	64.5	4:58	60.2	4:46	55.6	4:38	51.9	4:27
1400	79.6	5:59	74.8	5:48	69.9	5:34	64.6	5:25	60.4	5:12
1600	90.2	6:53	84.7	6:40	79.3	6:23	73.3	6:12	68.5	5:59
1800	100.7	7:47	94.7	7:31	88.7	7:13	82.0	7:00	76.7	6:45
2000	110.9	8:42	104.3	8:23	97.7	8:03	90.5	7:48	84.6	7:31
2200	121.0	9:37	114.0	9:16	106.8	8:52	98.9	8:37	92.5	8:18
2400	130.8	10:34	123.3	10:10	115.5	9:43	107.1	9:26	100.2	9:06
2600	140.6	11:31	132.6	11:03	124.3	10:34	115.2	10:15	107.8	9:53
2800	150.0	12:30	141.6	11:59	132.6	11:25	123.1	11:04	115.3	10:41
3000	159.4	13:28	150.6	12:54	141.0	12:17	130.9	11:54	122.7	11:29
3200	168.5	14:29	159.3	13:51	149.1	13:09	138.5	12:44	129.9	12:18
3400	177.5	15:30	168.0	14:48	157.1	14:02	146.1	13:35	137.1	13:06
3600	186.3	16:32	176.4	15:47	164.8	14:55	153.4	14:26	144.0	13:56
3800	195.0	17:35	184.8	16:45	172.6	15:49	160.7	15:18	151.0	14:45
4000	203.5	18:39	192.9	17:46	180.1	16:44	167.9	16:10	157.7	15:35

GEAR DOWN

Long Range Cruise Enroute Fuel and Time
Fuel Required Adjustment (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)							
	220	260	300	340	380	420	460	500
20	-4.5	-3.4	-2.2	-1.1	0.0	1.7	4.3	7.4
40	-9.6	-7.1	-4.7	-2.3	0.0	3.3	7.8	13.6
60	-14.5	-10.9	-7.2	-3.5	0.0	4.8	11.2	19.3
80	-19.4	-14.6	-9.6	-4.8	0.0	6.3	14.3	24.4
100	-24.2	-18.2	-12.1	-6.0	0.0	7.7	17.2	28.9
120	-28.9	-21.8	-14.5	-7.2	0.0	9.0	19.9	33.0
140	-33.6	-25.4	-17.0	-8.4	0.0	10.3	22.3	36.5
160	-38.2	-29.0	-19.4	-9.7	0.0	11.6	24.5	39.4
180	-42.7	-32.5	-21.8	-10.9	0.0	12.8	26.5	41.8
200	-47.1	-35.9	-24.2	-12.1	0.0	14.0	28.3	43.7
220	-51.5	-39.4	-26.5	-13.3	0.0	15.1	29.9	45.1

Based on Long Range Cruise speed and 220 KIAS descent.

Descent at 220 KIAS

PRESSURE ALTITUDE (1000 FT)	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	31	35	38	42	45	49	53	56	60	64
TIME (MINUTES)	10	11	12	12	13	14	14	15	16	16

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
500	TPR	44.9	50.1	58.9	70.6			
	KIAS	241	241	243	246			
	FF/ENG	10430	10490	10670	11030			
460	TPR	42.6	47.4	55.6	66.0	81.0		
	KIAS	236	237	237	238	242		
	FF/ENG	9790	9820	9930	10140	10810		
420	TPR	40.0	44.4	52.0	61.4	73.9		
	KIAS	229	230	230	231	232		
	FF/ENG	9050	9060	9130	9280	9570		
380	TPR	37.4	41.4	48.4	57.1	68.3	83.3	
	KIAS	222	222	223	223	224	224	
	FF/ENG	8330	8310	8350	8470	8670	9100	
340	TPR	34.8	38.4	44.8	52.7	62.9	75.8	
	KIAS	214	215	215	215	216	216	
	FF/ENG	7620	7590	7590	7670	7850	8040	
300	TPR	32.1	35.4	41.1	48.4	57.6	69.0	
	KIAS	206	206	206	207	207	207	
	FF/ENG	6930	6880	6860	6890	7060	7130	
260	TPR	29.5	32.5	37.6	44.1	52.3	62.3	76.0
	KIAS	198	198	198	198	198	198	198
	FF/ENG	6270	6190	6150	6150	6290	6290	6520
220	TPR	26.8	29.5	34.1	39.8	47.2	55.9	67.6
	KIAS	188	188	188	188	188	188	188
	FF/ENG	5610	5510	5440	5460	5570	5510	5620

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight - QRH **Chapter PI-QRH**
Gear Down, Engine INOP **Section 14**

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

Includes APU fuel burn

WEIGHT (1000 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
460	441	222	1900		
440	423	218	4100	900	
420	404	213	6000	3900	1000
400	385	209	8000	6200	4100
380	366	204	10100	8400	6400
360	349	199	12300	10400	8800
340	330	194	13900	12100	10800
320	310	188	15600	14100	12700
300	291	183	17300	16100	14800
280	272	177	19200	18100	17000
260	252	171	20900	20000	19000
240	232	165	23000	21800	20900

Long Range Cruise Altitude Capability

100 ft/min residual rate of climb

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
400	2700		
380	4900	1100	
360	6800	4300	800
340	8700	6600	4200
320	10900	8800	6600
300	12800	10700	9000
280	14200	12300	10900
260	15700	14100	12600
240	17300	16000	14500
220	19100	17900	16600

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)						
		5	7	9	11	13	15	17
380	TPR	75.6						
	MACH	.367						
	KIAS	222						
	FF/ENG	15785						
360	TPR	72.4	77.8					
	MACH	.361	.375					
	KIAS	218	219					
	FF/ENG	14991	15170					
340	TPR	69.3	74.3	80.1				
	MACH	.355	.368	.382				
	KIAS	215	215	215				
	FF/ENG	14230	14352	14559				
320	TPR	66.2	71.0	76.3	82.5			
	MACH	.348	.361	.375	.389			
	KIAS	211	211	211	211			
	FF/ENG	13483	13576	13719	13981			
300	TPR	63.2	67.6	72.6	78.2	85.0		
	MACH	.341	.354	.367	.382	.397		
	KIAS	206	206	206	206	207		
	FF/ENG	12735	12822	12920	13089	13415		
280	TPR	60.2	64.4	69.0	74.2	80.2	87.7	
	MACH	.334	.347	.360	.374	.388	.404	
	KIAS	202	202	202	202	202	202	
	FF/ENG	12011	12089	12173	12288	12482	12882	
260	TPR	57.2	61.2	65.5	70.3	75.7	82.1	
	MACH	.327	.339	.352	.365	.380	.395	
	KIAS	198	198	198	198	198	198	
	FF/ENG	11292	11362	11435	11521	11649	11881	
240	TPR	54.2	57.9	62.0	66.5	71.5	77.2	84.1
	MACH	.319	.331	.344	.357	.371	.386	.401
	KIAS	193	193	193	193	193	193	193
	FF/ENG	10584	10645	10713	10786	10876	11016	11291
220	TPR	51.1	54.6	58.4	62.6	67.2	72.4	78.5
	MACH	.311	.323	.335	.348	.362	.376	.391
	KIAS	188	188	188	188	188	188	188
	FF/ENG	9864	9911	9971	10037	10109	10207	10366

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
179	156	136	122	110	100	93	86	80	75	71
364	316	275	245	221	200	185	171	159	149	140
550	476	414	368	331	300	277	256	238	223	210
737	637	554	491	442	400	368	341	316	296	279
925	799	694	615	553	500	461	426	395	369	347
1113	961	833	738	664	600	552	510	473	442	416
1303	1124	974	862	775	700	645	595	552	516	485
1493	1287	1115	986	885	800	736	680	630	588	554
1685	1452	1256	1110	997	900	828	765	709	662	623
1877	1616	1397	1234	1108	1000	920	849	787	735	691

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	6		8		10		12		14	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
100	6.2	0:30	5.9	0:29	5.7	0:29	5.4	0:29	5.2	0:28
200	12.6	0:57	12.1	0:56	11.7	0:56	11.3	0:56	11.1	0:55
300	18.9	1:25	18.3	1:24	17.8	1:23	17.3	1:23	16.9	1:22
400	25.2	1:53	24.5	1:51	23.7	1:51	23.1	1:50	22.6	1:49
500	31.4	2:21	30.5	2:19	29.7	2:18	28.9	2:17	28.3	2:16
600	37.6	2:49	36.5	2:47	35.5	2:45	34.6	2:45	33.9	2:43
700	43.7	3:18	42.5	3:15	41.3	3:13	40.3	3:12	39.5	3:11
800	49.7	3:46	48.3	3:43	47.0	3:40	45.9	3:39	45.0	3:38
900	55.6	4:15	54.1	4:11	52.7	4:08	51.4	4:07	50.4	4:05
1000	61.5	4:44	59.9	4:39	58.3	4:36	56.9	4:34	55.7	4:33

Fuel Required Adjustment (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)							
	220	260	300	340	380	420	460	500
10	-2.4	-1.8	-1.2	-0.6	0.0	1.0	2.4	3.7
15	-3.7	-2.8	-1.9	-0.9	0.0	1.6	3.6	5.7
20	-5.0	-3.7	-2.5	-1.2	0.0	2.1	4.8	7.6
25	-6.3	-4.7	-3.2	-1.6	0.0	2.5	5.9	9.5
30	-7.7	-5.7	-3.8	-1.9	0.0	3.0	7.0	11.3
35	-9.0	-6.7	-4.5	-2.2	0.0	3.5	8.0	13.0
40	-10.3	-7.6	-5.1	-2.6	0.0	3.9	9.0	14.7
45	-11.6	-8.6	-5.8	-2.9	0.0	4.3	9.9	16.3
50	-12.9	-9.6	-6.4	-3.2	0.0	4.7	10.8	17.8
55	-14.2	-10.6	-7.1	-3.5	0.0	5.1	11.7	19.3
60	-15.5	-11.6	-7.7	-3.9	0.0	5.4	12.5	20.7
65	-16.8	-12.5	-8.3	-4.2	0.0	5.7	13.2	22.0

Includes APU fuel burn.

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
420	TPR	72.5			
	KIAS	229			
	FF/ENG	17960			
400	TPR	69.8			
	KIAS	226			
	FF/ENG	17150			
380	TPR	67.1	75.6		
	KIAS	222	222		
	FF/ENG	16340	16570		
360	TPR	64.4	72.4		
	KIAS	218	218		
	FF/ENG	15550	15740		
340	TPR	61.7	69.3	83.4	
	KIAS	214	215	215	
	FF/ENG	14770	14940	15470	
320	TPR	59.1	66.2	79.2	
	KIAS	210	211	211	
	FF/ENG	14000	14160	14510	
300	TPR	56.4	63.2	75.3	
	KIAS	206	206	206	
	FF/ENG	13230	13370	13640	
280	TPR	53.8	60.2	71.5	87.7
	KIAS	202	202	202	202
	FF/ENG	12490	12610	12830	13530
260	TPR	51.1	57.2	67.8	82.1
	KIAS	198	198	198	198
	FF/ENG	11760	11860	12050	12480
240	TPR	48.5	54.2	64.2	77.2
	KIAS	193	193	193	193
	FF/ENG	11040	11110	11290	11570
220	TPR	45.7	51.1	60.4	72.4
	KIAS	188	188	188	188
	FF/ENG	10290	10360	10500	10720

This table includes 5% additional fuel for holding in a racetrack pattern.

Performance Inflight - QRH
Text

Chapter PI-QRH
Section 20

Introduction

This chapter contains information to supplement performance data from the Flight Management Computer. In addition, sufficient inflight data is provided to complete a flight with the FMC inoperative. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

General

Flight with Unreliable Airspeed / Turbulent Air Penetration

Body attitude and average TPR information is provided for use in all phases of flight in the event of unreliable airspeed/Mach indications resulting from blocking or freezing of the pitot system. Loss of radome may also cause unreliable airspeed/Mach indications. Climb, cruise and descent information is based on the recommended turbulent air penetration speed schedule: 290 knots below 25000 feet, 310 knots or .85 Mach whichever is lower at 25000 feet and above; maintain a minimum speed of 15 knots above the minimum maneuvering speed when below .82 Mach. This schedule provides ample protection from stall and high speed buffet, while also providing protection from exceeding structural limits.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

Max Climb TPR

This table shows Max Climb TPR for a 310/.85 climb speed schedule and anti-ice on or off. Enter the table with airport pressure altitude and TAT and read TPR.

VREF Speeds

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

Advisory Information

Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. These values are actual landing distances and do not include the 1.67 regulatory factor. Therefore, they cannot be used to determine the dispatch required landing field length.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. If the surface is affected by water, snow, or ice, and the braking action is reported as "good", conditions should not be expected to be as good as on clean, dry runways. The value "good" is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when landing. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate "poor" data reflects runways covered with wet ice.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide corrections for off-reference landing weight, altitude, wind, slope, temperature, speed and reverser conditions. Each corrections

is independently added to the reference landing distance. The Reference landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative landing, check the rate of climb capability shown in Gear Down Landing Rate of Climb Available tables to ensure adequate climb performance.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. For normal operation, most landings are at weights below the AFM quick turnaround limit weight.

Use of the recommended cooling schedule will help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the Recommended Brake Cooling Schedule table with the airplane weight and brakes on speed, adjusted for wind, at the appropriate temperature and altitude condition. Instructions for applying wind adjustments are included below the table. Linear interpolation may be used to obtain intermediate values. The resulting number is the reference brake energy per brake in millions of foot-pounds, and represents the amount of energy absorbed by each brake during a rejected takeoff.

To determine the energy per brake absorbed during landing, enter the appropriate Event Adjusted Brake Energy Table (No Reverse Thrust or 2 Engine Reverse) with the reference brake energy per brake and the type of braking used during landing (Max Manual, Max Auto, or Autobrake). The resulting number is the adjusted brake energy per brake and represents the energy absorbed in each brake during the landing. The recommended cooling time is found in the final table by entering with the adjusted brake energy per brake. Times are provided for ground cooling and inflight gear down cooling.

Brake temperature indications on Multifunction Display are also shown. The hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted, may be used to determine recommended cooling schedule by entering at the bottom of the chart. An EICAS advisory message, BRAKE TEMP, will appear when any brake registers 5.0 or higher on the EICAS indication and disappear as the hottest brake cools with an EICAS indication of 3.5. Note that even without an EICAS advisory message, brake cooling is recommended.

Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, landing climb limits should be checked if a Flaps 25 or 30 landing is planned. Enter the table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

Fuel Heating Schedule

To Be Supplied.

Engine Inoperative

Initial Max Continuous TPR

The Initial Max Continuous TPR setting for use following an engine failure is shown. The table is based on the typical all engine cruise Mach number of .85 to provide a target TPR setting at the start of driftdown. Once driftdown is established, the Max Continuous TPR table should be used to determine TPR for the given conditions.

Max Continuous TPR

Power setting is based on one engine operating with anti-ice on or off. Enter the table with pressure altitude and IAS or Mach to read TPR.

It is desirable to maintain engine thrust level within the limits of the Max Cruise thrust rating. However, where thrust level in excess of Max Cruise rating is required, such as for meeting terrain clearance, ATC altitude assignments, or to attain maximum range capability, it is permissible to use the thrust needed up to the Max Continuous thrust rating. The Max Continuous thrust rating is intended primarily for emergency use at the discretion of the pilot and is the maximum thrust that may be used continuously.

Driftdown Speed/Level Off Altitude

The table shows optimum driftdown speed as a function of cruise weight at start of driftdown. Also shown are the approximate weight and pressure altitude at which the airplane will level off considering 100 ft/min residual rate of climb.

The level off altitude is dependent on air temperature (ISA deviation).

Driftdown/Cruise Range Capability

This table shows the range capability from the start of driftdown. Driftdown is continued to level off altitude. As weight decreases due to fuel burn, the airplane is accelerated to long range cruise speed. Cruise is continued at level off altitude and long range cruise speed.

To determine fuel required, enter the Ground to Air Miles Conversion table with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Diversion Fuel and Time table.

Long Range Cruise Altitude Capability

Table show the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on LRC speed, Max Continuous thrust, and 100 ft/min residual rate of climb.

Long Range Cruise Control

The table provides target TPR, engine inoperative Long Range Cruise Mach number, IAS and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.

Long Range Cruise Diversion Fuel and Time

Tables are provided for crews to determine the fuel and time required to proceed to an alternate airfield with one engine inoperative. The data is based on single engine Long Range Cruise speed and .85/310/250 descent. Enter with Air Distance as determined from the Ground to Air Miles Conversion Table and read Fuel and Time required at the cruise pressure altitude. Adjust the fuel obtained for deviation from the reference weight at checkpoint as required by entering the off reference fuel corrections table with the fuel required for the reference weight and the actual weight at checkpoint. Read fuel and time required for the actual weight.

Holding

Target TPR, indicated airspeed and fuel flow information is tabulated for holding with flaps up based on the FMC optimum holding speed schedule. This is higher of the maximum endurance speed and the maneuvering speed for the selected flap setting. Small variations in airspeed will not appreciably affect the overall endurance time. Enter the table with weight and pressure altitude to read TPR, IAS and fuel flow.

Gear Down Landing Rate of Climb Available

Rate of climb data is provided as guidance information in the event an engine inoperative landing is planned. The tables show gear down rate of climb available for Flaps 20 and Flaps 30. Enter the table with TAT and pressure altitude to read rate of climb available. Apply adjustments shown to correct for weight.

Maneuvers**Chapter Man****Table of Contents****Section 0**

Introduction	Man.05
General	Man.05.1
Non-Normal Maneuvers	Man.05.1
Flight Patterns	Man.05.1
Non - Normal Maneuvers	Man.1
Approach to Stall Recovery	Man.1.1
Rejected Takeoff	Man.1.1
Terrain Avoidance - Ground Proximity Caution	Man.1.4
Terrain Avoidance - Ground Proximity Warning	Man.1.4
Traffic Avoidance	Man.1.5
Upset Recovery	Man.1.8
Windshear Caution	Man.1.9
Windshear Warning	Man.1.10
Windshear Escape Maneuver	Man.1.11
Flight Patterns	Man.2
Takeoff	Man.2.1
ILS Approach	Man.2.2
Instrument Approach Using VNAV	Man.2.3
Instrument Approach Using V/S or FPA	Man.2.4
Circling Approach	Man.2.5
Visual Traffic Pattern	Man.2.6
Go-Around and Missed Approach	Man.2.7

Intentionally
Blank

Maneuvers**Chapter Man****Introduction****Section 05****General**

Non-Normal Maneuvers and Flight Patterns are included for training and review purposes.

Non-Normal Maneuvers

Flight crews are expected to do non-normal maneuvers from memory.

Flight Patterns

Flight patterns show procedures for some all-engine and engine-inoperative situations.

Flight patterns do not include all procedural items but show required/recommended:

- configuration changes
- thrust changes
- Mode Control Panel (MCP) changes
- pitch mode and roll mode changes
- checklist calls

Intentionally
Blank

Maneuvers**Chapter Man****Non - Normal Maneuvers****Section 1****Approach to Stall Recovery**

The following is immediately accomplished at the first indication of stall buffet or stick shaker.

Pilot Flying	Pilot Monitoring
• Advance the thrust levers to maximum thrust • Smoothly adjust the pitch attitude* to avoid ground contact or obstacles • Level the wings (do not change flaps or landing gear configuration) • Verify the speedbrakes are retracted	• Verify maximum thrust • Monitor altitude and airspeed • Call out any trend toward terrain contact • Verify all required actions have been completed and call out any omissions
When ground contact is no longer a factor: • Adjust the pitch attitude to accelerate while minimizing altitude loss • Return to a speed appropriate for the configuration	

Note: *If an approach to stall is encountered with the autopilot engaged, apply maximum thrust and allow the airplane to return to the normal airspeed.

Note: *At high altitude it may be necessary to descend to accelerate.

Note: If autopilot response is not acceptable, it should be disengaged.

Rejected Takeoff

The captain has the sole responsibility for the decision to reject the takeoff. The decision must be made in time to start the rejected takeoff maneuver by V1. If the decision is to reject the takeoff, the captain must clearly announce “REJECT,” immediately start the rejected takeoff maneuver, and assume control of the airplane. If the first officer is making the takeoff, the first officer must maintain control of the airplane until the captain makes a positive input to the controls.

Prior to 80 knots, the takeoff should be rejected for any of the following:

- activation of the master caution system
- system failure(s)
- unusual noise or vibration
- tire failure
- abnormally slow acceleration
- takeoff configuration warning
- fire or fire warning
- engine failure
- predictive windshear warning
- if the airplane is unsafe or unable to fly

Above 80 knots and prior to V1, the takeoff should be rejected for any of the following:

- fire or fire warning
- engine failure
- predictive windshear warning
- if the airplane is unsafe or unable to fly

During the takeoff, the crew member observing the non-normal situation will immediately call it out as clearly as possible.

787 Flight Crew Operations Manual

Captain	First Officer
Without delay: Simultaneously close the thrust levers, disengage the autothrottles, and apply maximum manual wheel brakes or verify operation of RTO autobrake. If RTO autobrake is selected, monitor system performance and apply manual wheel brakes if the AUTOBRAKE message is displayed or deceleration is not adequate. Verify the speedbrakes are extended. Apply the maximum amount of reverse thrust consistent with conditions. Continue maximum braking until certain the airplane will stop on the runway.	Verify actions as follows: Thrust levers closed. Autothrottles disengaged. Maximum brakes applied. Verify speedbrake lever UP and call “SPEEDBRAKES UP.” If speedbrake lever not UP call “SPEEDBRAKES NOT UP.” Reverse thrust applied. Call out any omitted action items.
Field length permitting: Initiate movement of the reverse thrust levers to reach the reverse idle detent by taxi speed.	Call out 60 knots. Communicate the reject decision to the control tower and cabin as soon as practical.
When the airplane is stopped, perform procedures as required. Review Brake Cooling Schedule for brake cooling time and precautions (refer to the Performance Inflight chapter). Consider the following: • the possibility of wheel fuse plugs melting • the need to clear the runway • the requirement for remote parking • wind direction in case of fire • alerting fire equipment • not setting the parking brake unless passenger evacuation is necessary • advising the ground crew of the hot brake hazard • advising passengers of the need to remain seated or evacuate • completion of Non-Normal checklist (if appropriate) for conditions which caused the RTO	

Terrain Avoidance - Ground Proximity Caution

Accomplish the following maneuver for any of these aural alerts*:

- CAUTION OBSTACLE
- CAUTION TERRAIN

Note: For JAA certificated airplanes, CAUTION OBSTACLE is replaced with OBSTACLE AHEAD, and CAUTION TERRAIN is replaced with TERRAIN AHEAD.

- SINK RATE
- TERRAIN
- DON'T SINK
- TOO LOW FLAPS
- TOO LOW GEAR
- TOO LOW TERRAIN
- GLIDESLOPE
- BANK ANGLE

Pilot Flying	Pilot Monitoring
Correct the flight path or the airplane configuration.	

The below glideslope deviation alert may be cancelled or inhibited for:

- localizer or back course approach
- circling approach from an ILS
- when conditions require a deliberate approach below glideslope
- unreliable glideslope signal

Note: If a terrain caution occurs when flying under daylight VMC, and positive visual verification is made that no obstacle or terrain hazard exists, the alert may be regarded as cautionary and the approach may be continued.

Note: *As installed, some repeat.

Terrain Avoidance - Ground Proximity Warning

Accomplish the following maneuver for any of these conditions:

- activation of the “PULL UP”, “OBSTACLE PULL UP” or “TERRAIN TERRAIN PULL UP” warning
- other situations resulting in unacceptable flight toward terrain

787 Flight Crew Operations Manual

Pilot Flying	Pilot Monitoring
• Disconnect autopilot • Disconnect autothrottle(s) • Aggressively apply maximum* thrust • Simultaneously roll wings level and rotate to an initial pitch attitude of 20° • Verify the speedbrakes are retracted • If terrain remains a threat, continue rotation up to the pitch limit indicator or stick shaker or initial buffet	• Assure maximum* thrust • Verify all required actions have been completed and call out any omissions
• Do not change gear or flap configuration until terrain separation is assured • Monitor radio altimeter for sustained or increasing terrain separation • When clear of the terrain, slowly decrease pitch attitude and accelerate	• Monitor vertical speed and altitude (radio altitude for terrain clearance and barometric altitude for a minimum safe altitude) • Call out any trend toward terrain contact

Note: Aft control column force increases as the airspeed decreases. In all cases, the pitch attitude that results in intermittent stick shaker or initial buffet is the upper pitch attitude limit. Flight at intermittent stick shaker may be required to obtain positive terrain separation. Smooth, steady control will avoid a pitch attitude overshoot and stall.

Note: Do not use flight director commands.

Note: * Maximum thrust can be obtained by advancing the thrust levers full forward if the EECs are in the normal mode. If terrain contact is imminent, advance thrust levers full forward.

Note: If positive visual verification is made that no obstacle or terrain hazard exists when flying under daylight VMC conditions prior to a terrain or obstacle (as installed) warning, the alert may be regarded as cautionary and the approach may be continued.

Traffic Avoidance

Immediately accomplish the following by recall whenever a TCAS traffic advisory (TA) or resolution advisory (RA) occurs.

WARNING: Comply with RA if there is a conflict between RA and air traffic control.

WARNING: Once an RA has been issued, safe separation can be compromised if current vertical speed is changed, except as necessary to comply with the RA. This is because TCAS II-to-TCAS II coordination may be in progress with the intruder aircraft, and any change in vertical speed that does not comply with the RA may negate the effectiveness of the other aircraft's compliance with the RA.

Note: If stick shaker or initial buffet occurs during the maneuver, immediately accomplish the APPROACH TO STALL RECOVERY procedure.

Note: If high speed buffet occurs during the maneuver, relax pitch force as necessary to reduce buffet, but continue the maneuver.

Note: Do not use flight director pitch commands until clear of conflict.

For TA:

Pilot Flying	Pilot Monitoring
Look for traffic using traffic display as a guide. Call out any conflicting traffic	
If traffic is sighted, maneuver if needed.	

Note: Maneuvers based solely on a TA may result in reduced separation and are not recommended

For RA, except a climb in landing configuration:

WARNING: A DESCEND (fly down) RA issued below 1000 feet AGL should not be followed.

Pilot Flying	Pilot Monitoring
If maneuvering is required, disengage the autopilot and autothrottle. Smoothly adjust pitch and thrust to satisfy the RA command. Follow the planned lateral flight path unless visual contact with the conflicting traffic requires other action.	
Attempt to establish visual contact. Call out any conflicting traffic.	

For a climb RA in landing configuration:

Pilot Flying	Pilot Monitoring
Disengage the autopilot and autothrottle. Advance thrust levers forward to ensure maximum thrust is attained and call for FLAPS 20. Smoothly adjust pitch to satisfy the RA command. Follow the planned lateral flight path unless visual contact with the conflicting traffic requires other action.	Verify maximum thrust set. Position flap lever to 20 detent.
Verify a positive rate of climb on the altimeter and call "GEAR UP."	Verify a positive rate of climb on the altimeter and call "POSITIVE RATE." Set the landing gear lever to UP.
Attempt to establish visual contact. Call out any conflicting traffic.	

Upset Recovery

An upset can generally be defined as unintentionally exceeding the following conditions:

- pitch attitude greater than 25 degrees nose up, or
- pitch attitude greater than 10 degrees nose down, or
- bank angle greater than 45 degrees, or
- within above parameters but flying at airspeeds inappropriate for the conditions

The following techniques represent a logical progression for recovering the airplane. The sequence of actions is for guidance only and represents a series of options to be considered and used depending on the situation. Not all the actions may be necessary once recovery is underway. If needed, use pitch trim sparingly. Careful use of rudder to aid roll control should be considered only if roll control is ineffective and the airplane is not stalled.

These techniques assume that the airplane is not stalled. A stalled condition can exist at any attitude and may be recognized by continuous stick shaker activation accompanied by one or more of the following:

- buffeting, which could be heavy at times
- lack of pitch authority and/or roll control
- inability to arrest descent rate

If the airplane is stalled, recovery from the stall must be accomplished first by applying and maintaining nose down elevator until stall recovery is complete and stick shaker activation ceases.

Nose High Recovery

Pilot Flying	Pilot Monitoring
• Recognize and confirm the situation	
• Disconnect autopilot and autothrottle • Apply as much as full nose down elevator • *Apply appropriate nose down stabilizer trim • Reduce thrust • *Roll (adjust bank angle) to obtain a nose down pitch rate • Complete the recovery: • when approaching the horizon, roll to wings level • check airspeed and adjust thrust • establish pitch attitude	• Call out attitude, airspeed and altitude throughout the recovery • Verify all required actions have been completed and call out any omissions

Nose Low Recovery

Pilot Flying	Pilot Monitoring
• Recognize and confirm the situation	
• Disconnect autopilot and autothrottle • Recover from stall, if required • *Roll in the shortest direction to wings level (unload and roll if bank angle is more than 90 degrees) • Recover to level flight: • apply nose up elevator • *apply nose up trim, if required • adjust thrust and drag as required	• Call out attitude, airspeed and altitude throughout the recovery • Verify all required actions have been completed and call out any omissions

WARNING: * Excessive use of pitch trim or rudder may aggravate an upset situation or may result in loss of control and/or high structural loads.

Windshear Caution

For predictive windshear caution alert: (“MONITOR RADAR DISPLAY” aural)

Pilot Flying	Pilot Monitoring
• Maneuver as required to avoid the windshear	

Windshear Warning

Predictive windshear warning during takeoff roll: (“WINDSHEAR AHEAD, WINDSHEAR AHEAD” aural)

- prior to V1, reject takeoff
- after V1, perform the Windshear Escape Maneuver

Windshear encountered during takeoff roll:

- If windshear is encountered prior to V1, there may not be sufficient runway remaining to stop if an RTO is initiated at V1. At VR, rotate at a normal rate toward a 15 degree pitch attitude. Once airborne, perform the Windshear Escape Maneuver.
- If windshear is encountered near the normal rotation speed and airspeed suddenly decreases, there may not be sufficient runway left to accelerate back to normal takeoff speed. If there is insufficient runway left to stop, initiate a normal rotation at least 2,000 feet before the end of the runway even if airspeed is low. Higher than normal attitudes may be required to lift off in the remaining runway. Ensure maximum thrust is set.

Predictive windshear warning during approach: (“GO-AROUND, WINDSHEAR AHEAD” aural)

- perform Windshear Escape Maneuver or, at pilot’s discretion, perform a normal go-around

Windshear encountered in flight:

- perform the Windshear Escape Maneuver

Note: The following are indications the airplane is in windshear:

- windshear warning (two-tone siren followed by “WINDSHEAR,WINDSHEAR,WINDSHEAR”) or
- unacceptable flight path deviations

Note: Unacceptable flight path deviations are recognized as uncontrolled changes from normal steady state flight conditions below 1000 feet AGL, in excess of any of the following:

- 15 knots indicated airspeed
- 500 FPM vertical speed
- 5 degrees pitch attitude
- 1 dot displacement from the glideslope
- unusual thrust lever position for a significant period of time

Windshear Escape Maneuver

Pilot Flying	Pilot Monitoring
MANUAL FLIGHT • Disconnect autopilot • Push either TO/GA switch • Aggressively apply maximum* thrust • Disconnect autothrottle(s) • Simultaneously roll wings level and rotate toward an initial pitch attitude of 15° • Verify the speedbrakes are retracted • Follow flight director TO/GA guidance (if available)	• Assure maximum* thrust • Verify all required actions have been completed and call out any omissions

Pilot Flying	Pilot Monitoring
AUTOMATIC FLIGHT • Press either TO/GA switch.** • Verify TO/GA mode annunciation • Verify thrust advances to GA power • Verify the speedbrakes are retracted • Monitor system performance***	• Assure maximum* thrust • Verify all required actions have been completed and call out any omissions
• Do not change gear or flap configuration until windshear is no longer a factor • Monitor vertical speed and altitude • Do not attempt to regain lost airspeed until windshear is no longer a factor	• Monitor vertical speed and altitude • Call out any trend toward terrain contact, descending flight path, or significant airspeed changes

Note: Aft control column force increases as the airspeed decreases. In all cases, the pitch attitude that results in intermittent stick shaker or initial buffet is the upper pitch attitude limit. Flight at intermittent stick shaker may be required to obtain positive terrain separation. Smooth, steady control will avoid a pitch attitude overshoot and stall.

Note: * Maximum thrust can be obtained by advancing the thrust levers full forward if the EECs are in the normal mode. If terrain contact is imminent, advance thrust levers full forward.

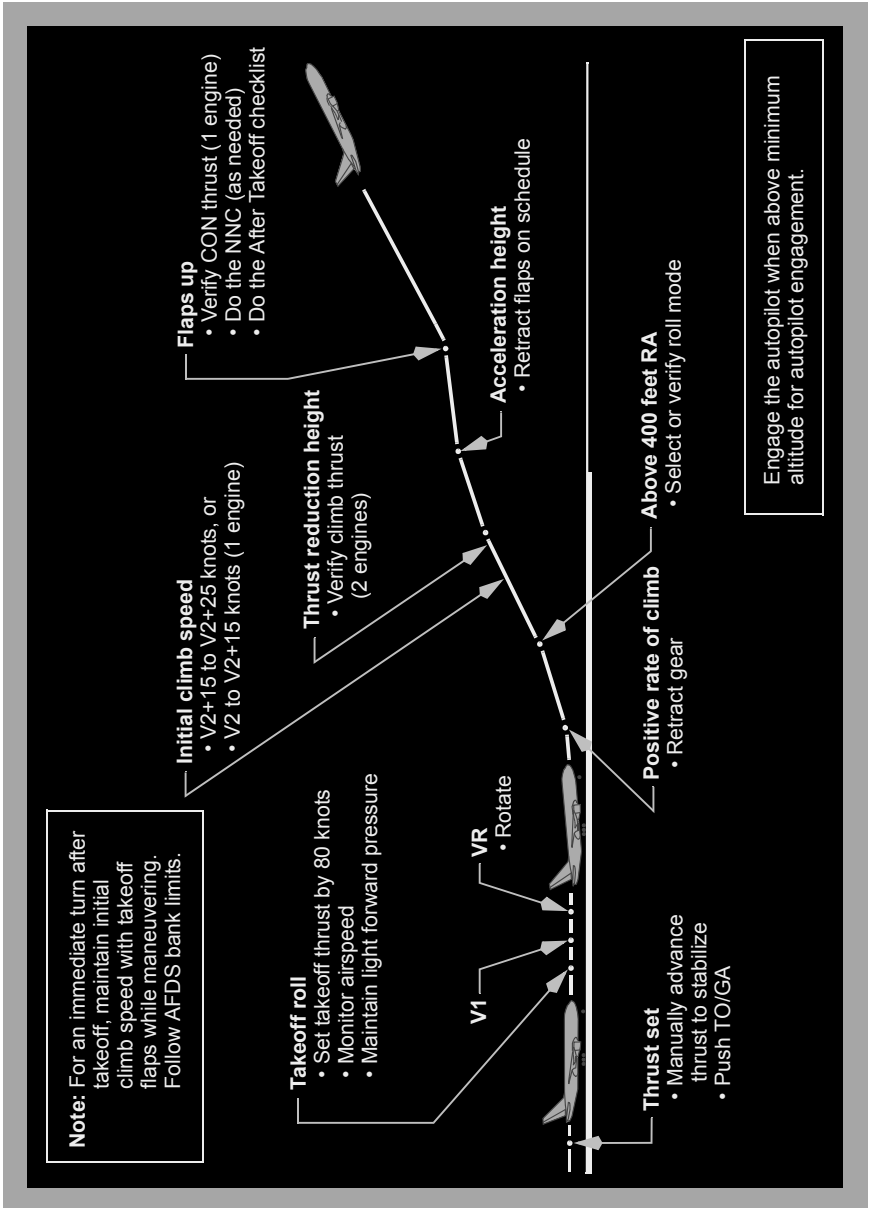
Note: ** If TO/GA is not available, disconnect autopilot and autothrottle(s) and fly manually.

WARNING: * Severe windshear may exceed the performance capability of the AFDS. The pilot flying must be prepared to disconnect the autopilot and autothrottle(s) and fly manually.**

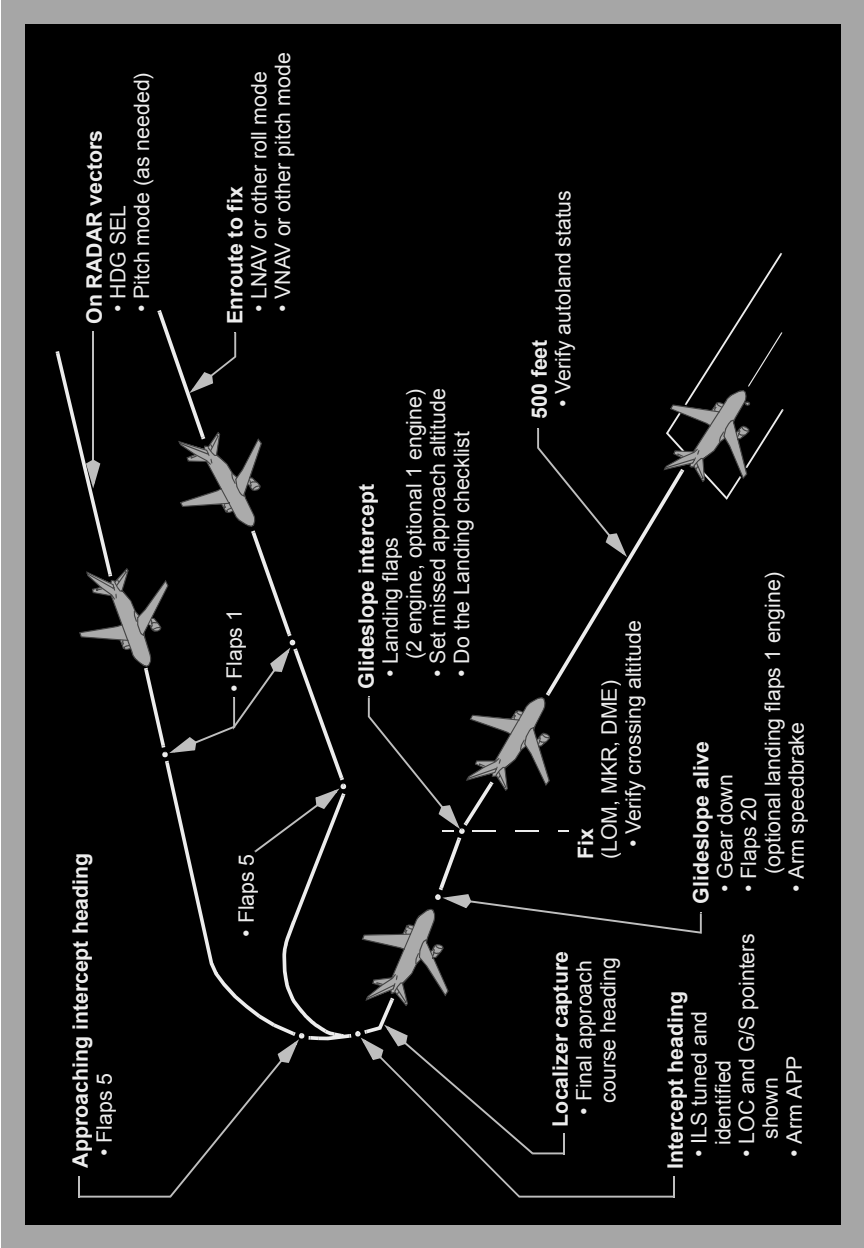
Maneuvers Flight Patterns

Chapter Man Section 2

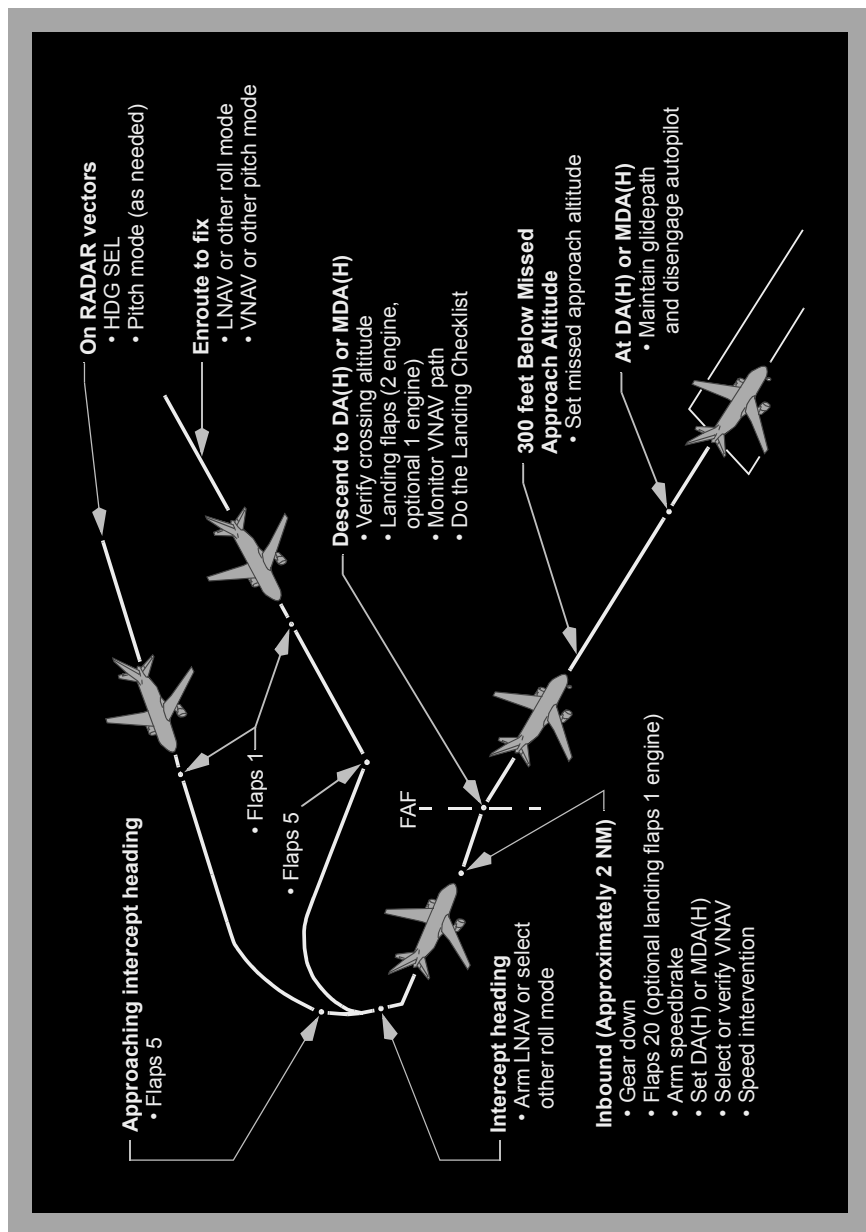
Takeoff



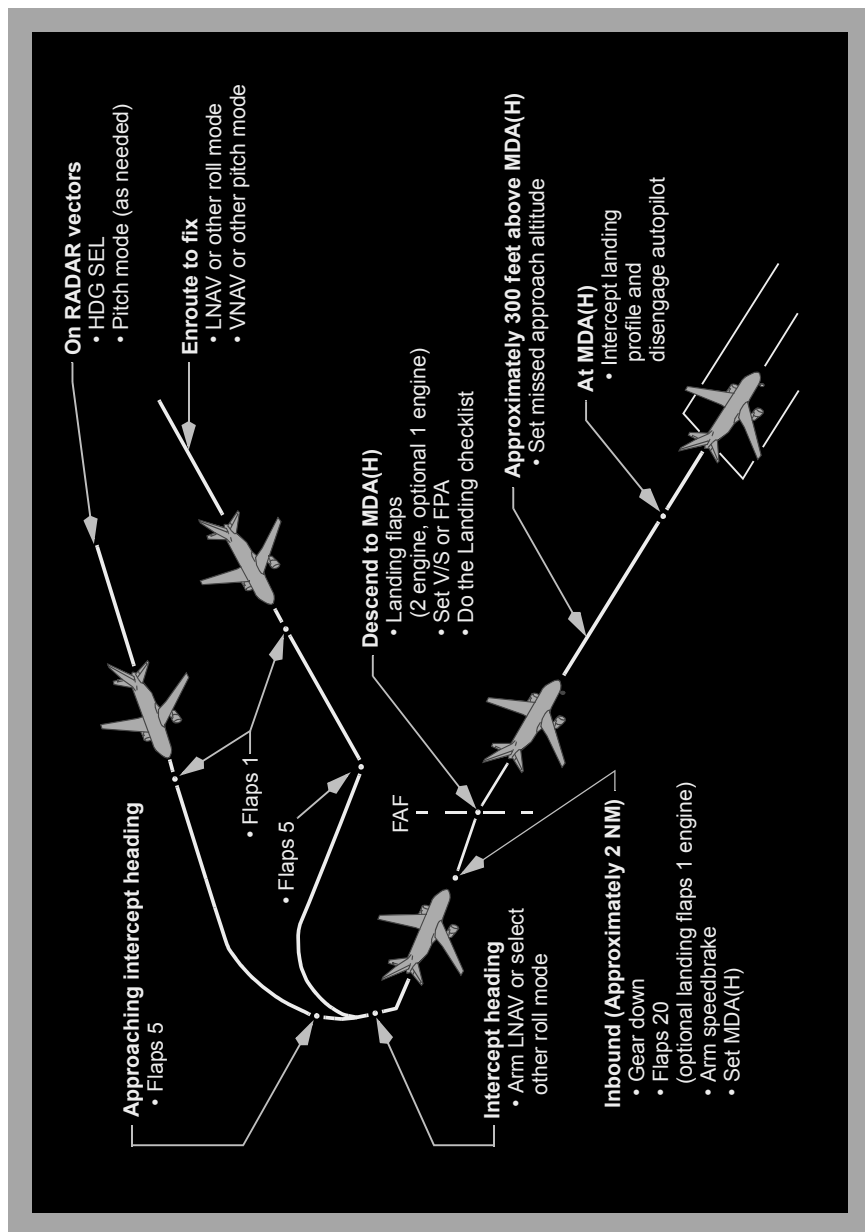
ILS Approach



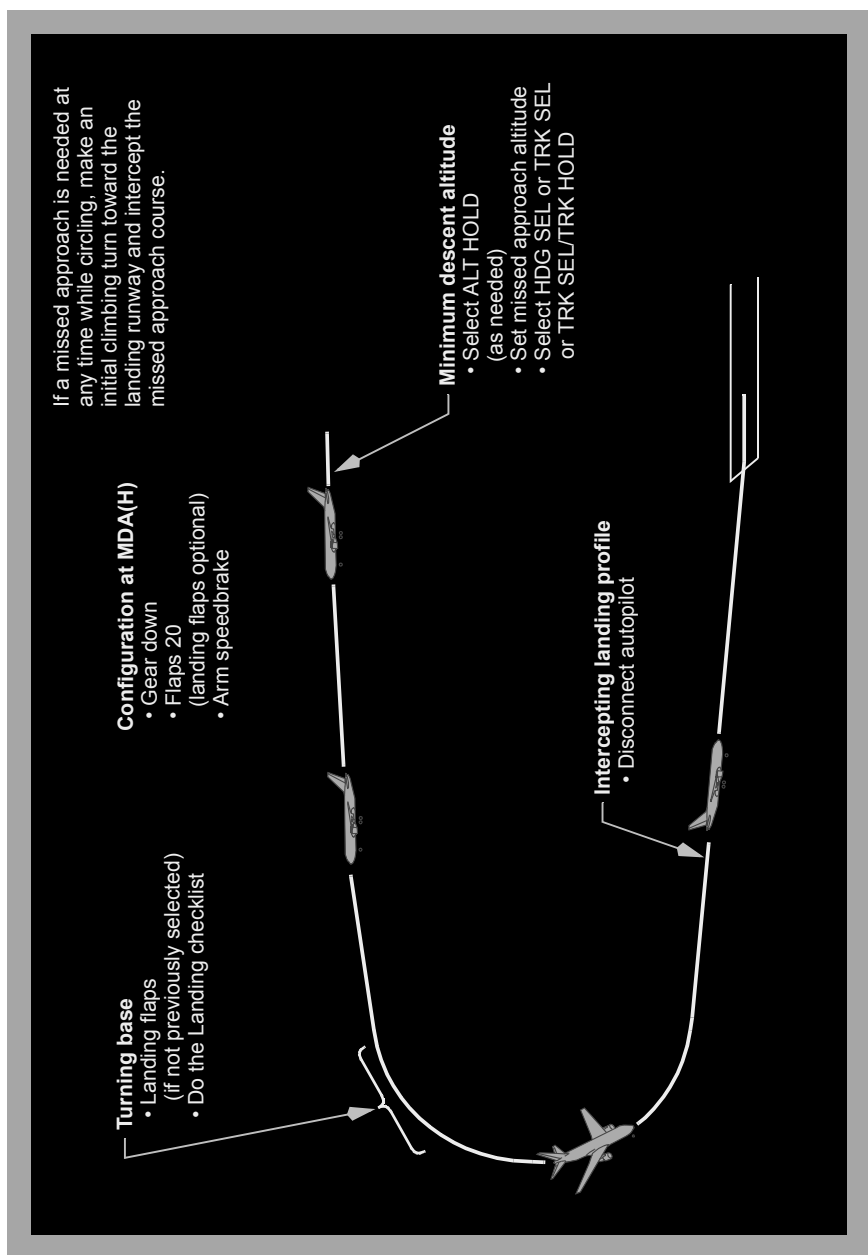
Instrument Approach Using VNAV



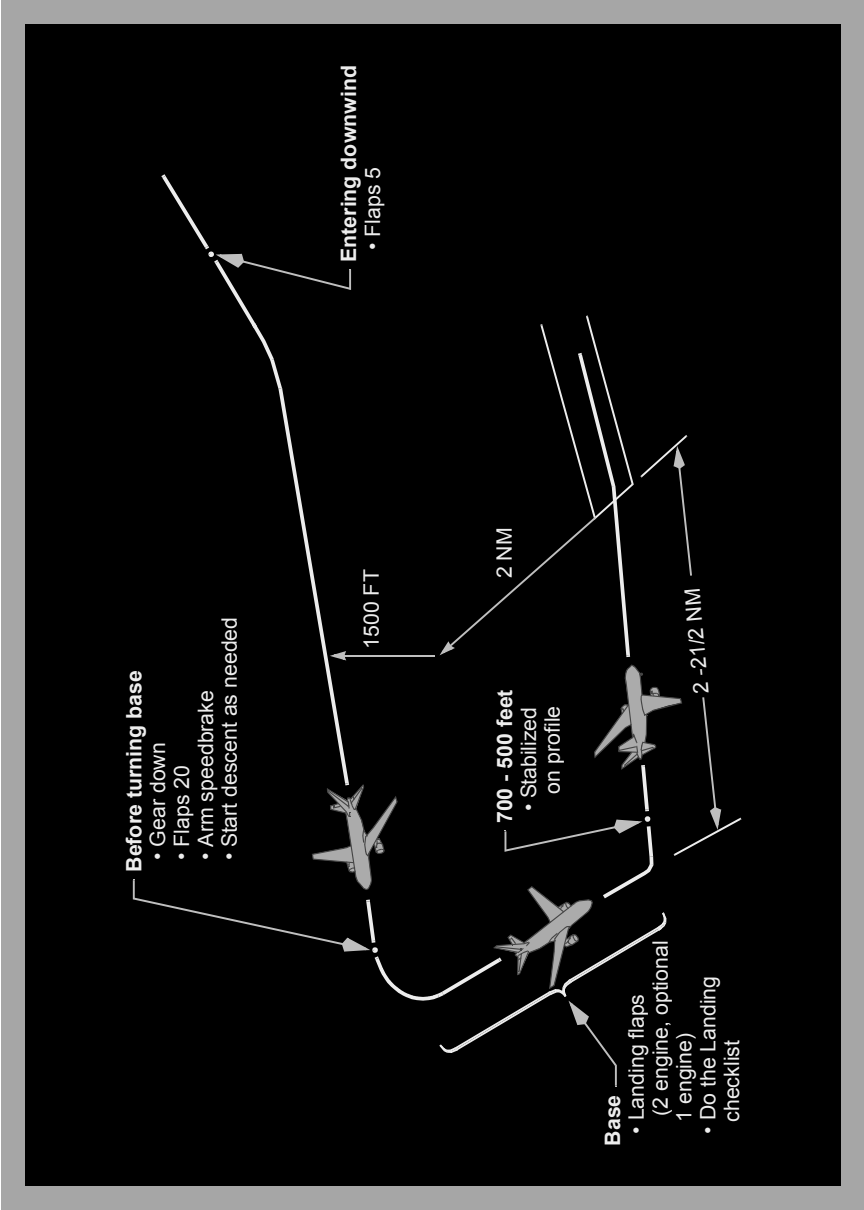
Instrument Approach Using V/S or FPA



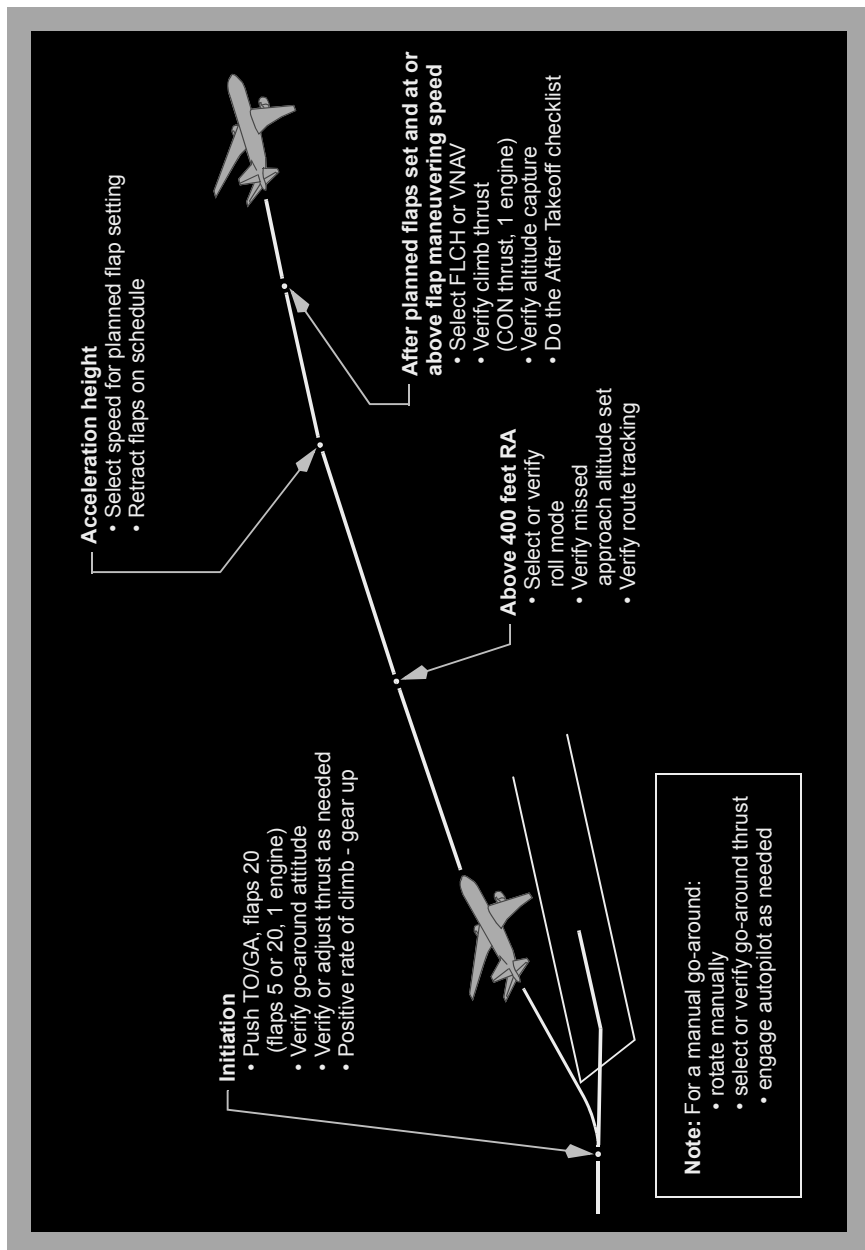
Circling Approach



Visual Traffic Pattern



Go-Around and Missed Approach



Intentionally
Blank

Checklist Instructions

Chapter CI

Table of Contents

Section 0

Model Identification	CI.ModID
Revision Record	CI.RR
QRH List of Effective Pages	CI.LEP
Normal Checklists.....	CI.1
Introduction	CI.1.1
Normal Checklist Operation	CI.1.1
Electronic Checklist Operation	CI.1.2
Checklist Content.....	CI.1.2
Checklist Construction.....	CI.1.3
Non-Normal Checklists	CI.2
Introduction	CI.2.1
Electronic Checklist Operation	CI.2.2
Non-Normal Checklist Operation	CI.2.2
Non-Normal Checklist Use.....	CI.2.4
Non-Normal Checklist Legend	CI.2.7
Redirection Symbol	CI.2.7
Separator symbol	CI.2.7
Task Divider Symbol	CI.2.7
Decision Symbol.....	CI.2.8
Precaution Symbol	CI.2.8

Intentionally
Blank

Checklist Instructions**Chapter CI****Model Identification****Section ModID****General**

The airplanes listed in the table below are covered in this manual. The numbers are used to distinguish data peculiar to one or more, but not all of the airplanes. Where data applies to all airplanes listed, no reference is made to individual airplane numbers.

The table permits flight crew correlation of configuration differences by Registry Number in alpha/numeric order within an operator's fleet for airplanes covered in this manual. Configuration data reflects the airplane as delivered configuration and is updated for service bulletin incorporations in conformance with the policy stated in the introduction section of this chapter.

Airplane number is supplied by the operator. Registry number is supplied by the national regulatory agency. Serial and tabulation numbers are supplied by Boeing.

Airplane Number	Registry Number	Serial Number	Tabulation Number
TBC-8	787-8	78708	ZX008

Intentionally
Blank

Checklist Instructions**Revision Record****Chapter CI****Section RR****Revision Transmittal Letter**

To: All holders of The Boeing Company 787 Flight Crew Operations Manual, Boeing Document Number D615Z003-TBC.

Subject: Flight Crew Operations Manual Revision.

This revision reflects the most current information available to The Boeing Company 45 days before the subject revision date. The following revision highlights explain changes in this revision. General information below explains the use of revision bars to identify new or revised information.

Revision Record

No.	Revision Date	Date Filed
0	October 31, 2007	
2	February 13, 2009	
4	February 15, 2010	

No.	Revision Date	Date Filed
1	June 16, 2008	
3	August 14, 2009	

General

The Boeing Company issues flight crew operations manual revisions to provide new or revised procedures and information. Formal revisions also incorporate appropriate information from previously issued flight crew operations manual bulletins.

The revision date is the approximate date the manual is mailed to the customer.

Formal revisions include a Transmittal Letter, a new Revision Record, Revision Highlights, and a current List of Effective Pages. Use the information on the new Revision Record and List of Effective Pages to verify the manual content.

Pages containing revised technical material have revision bars associated with the changed text or illustration. Editorial revisions (for example, spelling corrections) may have revision bars with no associated highlight.

The record above should be completed by the person incorporating the revision into the manual.

Filing Instructions

Consult the List of Effective Pages (CI.LEP). Pages identified with an asterisk (*) are either replacement pages or new (original) issue pages. Remove corresponding old pages and replace or add new pages. Remove pages that are marked DELETED; there are no replacement pages for deleted pages.

Revision Highlights

This section (CI.RR) replaces the existing section CI.RR in your manual.

Be careful when inserting changes not to throw away pages from the manual that are not replaced. Using the List of Effective Pages (CI.LEP) can help determine the correct content of the manual.

Throughout the manual, airplane effectivity may be updated to reflect coverage as listed on the Preface - Model Identification page, or to show service bulletin airplane effectivity. Highlights are not supplied.

This manual is published from a database; the text and illustrations are marked with configuration information. Occasionally, because the editors rearrange the database markers, or mark items with configuration information due to the addition of new database content, some customers may receive revision bars on content that appears to be unchanged. Pages may also be republished without revision bars due to slight changes in the flow of the document.

Chapter NNC - Non-Normal Checklists

Section 0 - Unannunciated Checklists

Ditching

- 0.2 - Changed steps based on procedural validation.
- 0.2,4 - Changed step based on procedural validation.
- 0.2 - Added steps based on procedural validation.
- 0.2-3 - Moved steps based on procedural validation.
- 0.3 - Moved seat belt step based on procedural validation.
- 0.3 - Removed instruction based on procedural validation.
- 0.4 - Removed extension text based on procedural validation.
- 0.4 - Changed extension text based on procedural validation.
- 0.4 - Added step based on procedural validation.
- 0.5 - Added checklist based on procedural validation.

Section 1 - Airplane General, Emer. Equip., Doors, Windows**FD DOOR LOCK FAIL**

- 1.6 - Changed FD DOOR LOCK FAIL condition based on procedural validation.

Section 2 - Air Systems**CABIN TEMPERATURE**

- 2.4 - Changed step based on procedural validation.
- 2.4 - Changed daylight step based on procedural validation.
- 2.5 - Removed extension text based on procedural validation.
- 2.5 - Changed "flight deck overhead door vent valve" to "flight deck overhead vent."

CARGO A/C FWD

- 2.6 - Removed icon from title.

PACK L+R

- 2.14 - Changed conditional based on procedural validation.
- 2.15 - Changed heaters step based on procedural validation.
- 2.15 - Changed daylight step based on procedural validation.
- 2.15 - Deleted extension text based on procedural validation.
- 2.15 - Changed "flight deck overhead door vent valve" to "flight deck overhead vent."

Section 3 - Anti-Ice, Rain**ANTI-ICE DET WING**

- 3.1 - Revised the ANTI-ICE DET WING note based on new system information.

ANTI-ICE ENG L, R

- 3.1 - Revised the ANTI-ICE ENG note based on new system information.

ANTI-ICE LEAK ENG L, R

- 3.4-5 - Revised deferred items.

ANTI-ICE ON

- 3.5 - Made editorial change.
- 3.5 - Revised the ANTI-ICE ON checklist based on new system information.

ICE DETECTORS

3.7 - Revised the ICE DETECTORS checklist based on new system information.

WING ANTI-ICE OFF

3.13 - Revised the WING ANTI-ICE OFF checklist based on new system information.

Section 4 - Automatic Flight

A/P BACKDRIVE WHEEL

4.3 - Changed note based on procedural validation.

Section 6 - Electrical

ELEC AC BUS L1

6.1 - Revised the APU expanded information for accuracy. The APU supplies another source of electrical power to improve pack performance.

ELEC AC BUS R1

6.4 - Revised the APU expanded information for accuracy. The APU supplies another source of electrical power to improve pack performance.

ELEC CABIN/UTIL OFF

6.7 - Made editorial change for standardization.

ELEC IFE/SEATS OFF

6.9 - Changed condition statement based on procedural validation.

MAIN BATTERY DISCH

6.10 - Standardized the MAIN BATTERY DISCH condition.

Section 7 - Engines, APU

ENG LIMIT EXCEED L, R

7.6 - Revised the deferred items.

Eng Svr Damage/Sep L, R

7.10 - Revised the deferred items.

ENG FAIL L, R

7.14-15 - Deleted extension text based on procedural validation.

7.14 - Removed N1 as a condition for engine restart . In some cases, N1 may not be displayed but still be capable of starting.

7.17 - Revised the deferred items.

787 Flight Crew Operations Manual

ENG FUEL VALVE L, R

7.18-19 - The ENG FUEL VALVE checklist is revised. The step to select the START selector to NORM is not necessary and is deleted.

Eng In-Flight Start L, R

7.20,22 - Removed N1 as a condition for engine restart . In some cases, N1 may not be displayed but still be capable of starting.

ENG OIL FILTER L, R

7.24 - Revised the message blanks steps for accuracy.

7.26 - Revised the deferred items.

ENG OIL PRESS L, R

7.30-31 - Revised the deferred items.

ENG OIL TEMP L, R

7.34,37 - Revised the deferred items.

Section 8 - Fire Protection**FIRE ENG L, R**

8.4 - Revised deferred items.

Smoke, Fire or Fumes

8.7 - Changed conditional based on procedural validation.

8.9-10 - Changed choice based on procedural validation.

FIRE WHEEL WELL

8.18 - Changed EXTEND step based on procedural validation.

8.18 - Added ALTN GEAR step based on procedural validation.

8.19 - Added Do not accomplish step based on procedural validation.

OVERHEAT ENG L, R

8.22 - Revised deferred items.

OVERHEAT WHEEL WELL

8.23 - Changed EXTEND step based on procedural validation.

Section 9 - Flight Controls**AUTO SPEEDBRAKE**

9.3 - Added deferred items.

FLAPS DRIVE

9.6 - Changed NOTE based on procedural validation.

PITCH UP AUTHORITY

9.20 - Added deferred items.

STALL PROTECTION

9.36 - Added deferred items.

Section 10 - Flight Instruments, Displays

AIRSPPEED UNRELIABLE

10.1 - Checklist replaced with 777 version.

10.1 - Changed condition based on procedural validation.

10.3-5 - Added checklist steps based on procedural validation.

10.3,5 - Reformatted steps for cross model standardization.

10.5-6 - Added deferred items.

Loss of All Displays

10.8 - Revised the Loss of All Displays checklist.

10.9,12 - Changed step based on procedural validation.

10.11 - Changed Note based on procedural validation.

10.11 - Added a note to plan more time for slower flap operation.

10.12 - Deleted the deferred item for alternate flaps extension inoperative.

HUD SNGL OPERATION

10.15 - Revised the note for clarity.

Section 11 - Flight Management, Navigation

FMC VERIFY POSITION

11.5 - Added icon to title.

11.5 - Revised the FMC VERIFY POSITION checklist.

NAV AIR DATA SYS

11.10 - Changed NOTE based on procedural validation.

11.11 - Revised the deferred Speedbrake item in the NAV AIR DATA SYS checklist.

NAV AIRSPEED DATA

11.14 - Changed NOTE based on procedural validation.

11.15 - Added deferred items to the NAV AIRSPEED DATA checklist.

11.15 - Revised the deferred Speedbrake item in the NAV AIR DATA SYS checklist.

787 Flight Crew Operations Manual

NAV APPROACH GLS

11.15 - Removed icon from title.

NAV APPROACH ILS

11.16 - Removed icon from title.

NAV INERTIAL SYS

11.20-21 - Added deferred items.

11.21 - Revised the deferred Speedbrake item in the NAV AIR DATA SYS checklist.

NAV IRU

11.21 - Revised NAV IRU note based on checklist validation.

Section 12 - Fuel**FUEL AUTO JETTISON**

12.1-2 - Added FUEL TO REMAIN step based on procedural validation.

12.2 - Moved DO not accomplish step based on procedural validation.

FUEL CROSSFEED

12.6 - Checklist changed significantly based on procedural validation.

FUEL JETTISON MAIN

12.11 - Added FUEL TO REMAIN step based on procedural validation.

FUEL JETTISON SYS

12.12 - Changed condition based on procedural validation.

12.12 - Made major changes to checklist based on procedural validation.

FUEL PRESS ENG L, R

12.18 - Changed objective based on procedural validation.

12.18 - Added new note and reformatted existing note based on procedural validation.

FUEL QTY LOW

12.23 - Added inhibited checklists based on procedural validation.

Section 13 - Hydraulics**HYD PRESS SYS C**

13.6 - Changed note based on procedural validation.

HYD PRESS SYS L

13.8 - Changed NOTE to match standard wording.

HYD PRESS SYS L+C

13.11 - Changed note based on procedural validation.

HYD PRESS SYS R+C

13.19 - Changed note based on procedural validation.

Section 14 - Landing Gear

BRAKE TEMP

14.2 - Changed speed format based on procedural validation.

GEAR DISAGREE

14.3 - Changed speed format based on procedural validation.

14.4 - Moved pattern altitude step to deferred items.

14.4 - Added deferred items.

GEAR DOOR

14.6 - Changed speed format based on procedural validation.

GEAR DRAG BRACE L, R

14.6 - Moved pattern altitude step to deferred items.

14.7 - Added deferred items.

GEAR SIDE BRACE L, R

14.8 - Moved pattern altitude step to deferred items.

14.9 - Added deferred items.

Section 15 - Warning Systems

GPWS TERR OVRD

15.4 - Removed MONITOR RADAR DISP checklist.

TCAS RA CAPTAIN, F/O

15.6 - The TCAS RA CAPTAIN, F/O condition is revised. TCAS cannot show RA guidance on the affected PFD and HUD.

Chapter PI-QRH - Performance Inflight - QRH

Section 10 - Table of Contents

PI-QRH.TOC.10.1 - 787-8 LB FAA was added as Section 10.

Section 10 - General

General

PI-QRH.10.1 - 787-8 LB FAA was added as Section 10.

Section 20 - Text

Text

PI-QRH.20.1 - 787-8 LB FAA was added as Section 20.

Chapter Man - Maneuvers**Section 1 - Non - Normal Maneuvers**

Approach to Stall Recovery

Man.1.1 - Revised the Approach to Stall Recovery maneuver.

Section 2 - Flight Patterns

Circling Approach

Man.2.5 - Added select TRK SEL/TRK HOLD to (as needed) minimum descent altitude.

Chapter CI - Checklist Instructions**Section 2 - Non-Normal Checklists**

Non-Normal Checklist Operation

CI.2.2 - Added new information that in-flight troubleshooting may cause further loss of system function or system failure.

CI.2.3 - No technical change. Reformatted structured lists throughout chapter/section to comply with publishing standard.

Separator symbol

CI.2.7 - No technical change. Reformatted structured list throughout chapter/section to comply with publishing standard.

Intentionally
Blank

Checklist Instructions
QRH List of Effective Pages**Chapter CI**
Section LEP

Page	Date
Quick Reference Handbook	
Quick Action Index	
* QA.Index.1-2	February 15, 2010
EICAS Messages (tab)	
* EICAS.Index.1-12	February 15, 2010
Unannunciated (tab)	
* Unann.Index.1-2	February 15, 2010
Alphabetical (tab)	
* Alpha.Index.1-12	February 15, 2010
Normal Checklists (tab)	
NC.1-4	August 14, 2009
0 Miscellaneous (tab)	
0.TOC.1-2	October 31, 2007
* 0.1-6	February 15, 2010
0.7	August 14, 2009
0.8	June 16, 2008
1 Airplane General, Emergency Equipment, Doors, Windows (tab)	
1.TOC.1-2	August 14, 2009
1.1	August 14, 2009
1.2	February 13, 2009
1.3-5	August 14, 2009
* 1.6	February 15, 2010
1.7-9	August 14, 2009
1.10	June 16, 2008

Page	Date
2 Air Systems (tab)	
* 2.TOC.1-2	February 15, 2010
2.1-2	February 13, 2009
2.3	August 14, 2009
* 2.4-9	February 15, 2010
2.10-13	August 14, 2009
* 2.14-17	February 15, 2010
2.18	August 14, 2009
3 Anti-Ice, Rain (tab)	
* 3.TOC.1-2	February 15, 2010
* 3.1	February 15, 2010
3.2-3	August 14, 2009
* 3.4-5	February 15, 2010
3.6	February 13, 2009
* 3.7-14	February 15, 2010
* 3.15-16	Deleted
4 Automatic Flight (tab)	
* 4.TOC.1-2	February 15, 2010
4.1-2	February 13, 2009
* 4.3-4	February 15, 2010
5 Communications (tab)	
5.TOC.1-2	October 31, 2007
5.1	August 14, 2009
5.2	October 31, 2007

* = Revised, Added, or Deleted

Copyright © The Boeing Company. See title page for details.

787 Flight Crew Operations Manual

Page	Date	Page	Date
6 Electrical (tab)		9 Flight Controls (tab)	
6.TOC.1-2	August 14, 2009	* 9.TOC.1-2	February 15, 2010
* 6.1	February 15, 2010	9.1	February 13, 2009
6.2-3	August 14, 2009	* 9.2-36	February 15, 2010
* 6.4	February 15, 2010	10 Flight Instruments, Displays (tab)	
6.5-6	August 14, 2009	* 10.TOC.1-2	February 15, 2010
* 6.7	February 15, 2010	* 10.1-16	February 15, 2010
6.8	August 14, 2009	11 Flight Management, Navigation (tab)	
* 6.9-10	February 15, 2010	* 11.TOC.1-2	February 15, 2010
7 Engines, APU (tab)		11.1	June 16, 2008
* 7.TOC.1-2	February 15, 2010	11.2	August 14, 2009
7.1	February 13, 2009	11.3	June 16, 2008
7.2-5	August 14, 2009	11.4	February 13, 2009
* 7.6	February 15, 2010	* 11.5-6	February 15, 2010
7.7-9	August 14, 2009	11.7	February 13, 2009
* 7.10	February 15, 2010	11.8-9	August 14, 2009
7.11-12	August 14, 2009	* 11.10-11	February 15, 2010
* 7.13-48	February 15, 2010	11.12-13	August 14, 2009
* 7.49-50	Deleted	* 11.14-26	February 15, 2010
8 Fire Protection (tab)		12 Fuel (tab)	
* 8.TOC.1-2	February 15, 2010	* 12.TOC.1-2	February 15, 2010
8.1-3	August 14, 2009	* 12.1-2	February 15, 2010
* 8.4	February 15, 2010	12.3-5	August 14, 2009
8.5	August 14, 2009	* 12.6-8	February 15, 2010
* 8.6-7	February 15, 2010	12.9-10	August 14, 2009
8.8	August 14, 2009	* 12.11-26	February 15, 2010
* 8.9-10	February 15, 2010	13 Hydraulics (tab)	
8.11-17	August 14, 2009	13.TOC.1-2	August 14, 2009
* 8.18-34	February 15, 2010	13.1-3	August 14, 2009
		13.4	February 13, 2009
		13.5	August 14, 2009

* = Revised, Added, or Deleted

787 Flight Crew Operations Manual

Page	Date	Page	Date
13 Hydraulics (cont)		Performance - Inflight (tab)	
* 13.6	February 15, 2010	* PI.TOC.1-2	February 15, 2010
13.7	August 14, 2009	* PI-QRH.TOC.10.1-2	February 15, 2010
* 13.8	February 15, 2010	* PI-QRH.10.1-4	February 15, 2010
13.9-10	August 14, 2009	* PI-QRH.10.5-6	Deleted
* 13.11	February 15, 2010	* PI-QRH.11.1-24	February 15, 2010
13.12-18	August 14, 2009	* PI-QRH.11.25-28	Deleted
* 13.19	February 15, 2010	* PI-QRH.12.1-12	February 15, 2010
13.20-22	August 14, 2009	* PI-QRH.13.1-4	February 15, 2010
14 Landing Gear (tab)		* PI-QRH.14.1-4	February 15, 2010
* 14.TOC.1-2	February 15, 2010	* PI-QRH.15.1-6	Deleted
14.1	August 14, 2009	* PI-QRH.20.1-6	February 15, 2010
* 14.2-10	February 15, 2010	Maneuvers (tab)	
15 Warning Systems (tab)		Man.TOC.0.1-2	August 14, 2009
* 15.TOC.1-2	February 15, 2010	Man.05.1-2	October 31, 2007
15.1	August 14, 2009	* Man.1.1	February 15, 2010
15.2	October 31, 2007	Man.1.2-4	August 14, 2009
15.3	June 16, 2008	Man.1.5	June 16, 2008
* 15.4	February 15, 2010	Man.1.6-10	August 14, 2009
15.5	August 14, 2009	* Man.1.11-12	February 15, 2010
* 15.6	February 15, 2010	Man.2.1-4	October 31, 2007
Ops Info (tab)		* Man.2.5	February 15, 2010
OI.TOC.1-2	June 16, 2008	Man.2.6-8	October 31, 2007
OI.1.1	June 16, 2008	Checklist Instructions (tab)	
OI.1.2	October 31, 2007	CI.TOC.0.1-2	February 13, 2009
		* CI.ModID.1-2	February 15, 2010
		* CI.RR.1-10	February 15, 2010
		* CI.RR.11-16	Deleted
		* CI.LEP.1-4	February 15, 2010
		CI.1.1	October 31, 2007

* = Revised, Added, or Deleted

Copyright © The Boeing Company. See title page for details.

Page	Date
Checklist Instructions (cont)	
CI.1.2	February 13, 2009
CI.1.3-4	October 31, 2007
CI.2.1	June 16, 2008
* CI.2.2-3	February 15, 2010
CI.2.4	June 16, 2008
CI.2.5-6	February 13, 2009
* CI.2.7	February 15, 2010
CI.2.8	February 13, 2009
Evacuation	
Back Cover.1	October 31, 2007
Back Cover.2	August 14, 2009

* = Revised, Added, or Deleted

Checklist Instructions**Normal Checklists****Chapter CI****Section 1****Introduction**

This introduction gives guidelines for use of the printed version of the Normal Checklist (NC) as well as the Electronic Checklist (ECL).

The NC is organized by phase of flight.

The NC is used to verify that critical items have been done.

Normal Checklist Operation

Normal checklists are used after doing all respective procedural items.

The following table shows which pilot calls for the checklist and which pilot reads the checklist. Both pilots visually verify that each item is in the needed configuration or that the step is done. The far right column shows which pilot gives the response. This is different than the normal procedures where the far right column can show which pilot does the step.

Checklist	Call	Read	Verify	Respond
PREFLIGHT	Captain	First officer	Both	Area of responsibility
BEFORE START	Captain	First officer	Both	Area of responsibility
BEFORE TAXI	Captain	First officer	Both	Area of responsibility
BEFORE TAKEOFF	Pilot flying	Pilot monitoring	Both	Pilot flying
AFTER TAKEOFF	Pilot flying	Pilot monitoring	Both	Pilot monitoring
DESCENT	Pilot flying	Pilot monitoring	Both	Area of responsibility
APPROACH	Pilot flying	Pilot monitoring	Both	Area of responsibility
LANDING	Pilot flying	Pilot monitoring	Both	Pilot flying
SHUTDOWN	Captain	First officer	Both	Area of responsibility
SECURE	Captain	First officer	Both	Area of responsibility

If the airplane configuration does not agree with the needed configuration:

- stop the checklist
- complete the respective procedure steps
- continue the checklist

If it becomes apparent that an entire procedure was not done:

- stop the checklist
- complete the entire procedure
- do the checklist from the start

Try to do checklists before or after high work load times. The crew may need to stop a checklist for a short time to do other tasks. If the interruption is short, continue the checklist with the next step. If a pilot is not sure where the checklist was stopped, do the checklist from the start. If the checklist is stopped for a long time, also do the checklist from the start.

After completion of each checklist, the pilot reading the checklist calls,
"_____ CHECKLIST COMPLETE."

Electronic Checklist Operation

Operation with the electronic normal checklist is the same as the printed normal checklist except that, there is no need to read aloud or visually confirm items that are complete (green). For the BEFORE TAKEOFF and LANDING checklists, the PM announces "___ CHECKLIST COMPLETE," the PF visually confirms that the CHECKLIST COMPLETE indication is shown, and announces "CHECKLIST COMPLETE."

Closed loop (sensed) checklist items change from white to green when the action is taken. The PM is responsible to check off any open loop (not sensed) item and to verify that all closed loop items are green. See Chapter 10, Flight Instruments, Displays, for a complete description of the electronic checklist system.

Checklist Content

The checklist has the minimum items needed to operate the airplane safely.

Normal checklists have items that meet any of the following criteria:

- items essential to safety of flight that are not monitored by an alerting system, or
- items essential to safety of flight that are monitored by an alerting system but if not done, would likely result in a catastrophic event if the alerting system fails, or
- items needed to meet regulatory requirements, or
- items needed to maintain fleet commonality between the 737, 747-400, 757, 767, 777, and 787, or
- items that enhance safety of flight and are not monitored by an alerting system (example the autobrake), or
- during shutdown and secure, items that could result in injury to personnel or damage to equipment if not done

Checklist Construction

When a checklist challenge does not end with “switch or lever”, then the challenge refers to system status. For example, “Landing Gear...Down”, refers to the status of the landing gear, not just the position of the lever.

When a checklist challenge ends with “switch or lever”, then the challenge refers to the position of the switch or lever. For example, “FUEL CONTROL switches...CUTOFF” refers to the position of the switches.

Intentionally
Blank

Checklist Instructions
Non-Normal Checklists**Chapter CI**
Section 2**Introduction**

The non-normal checklists chapter contains checklists used by the flight crew to manage non-normal situations. The checklists are grouped in sections which match the system description chapters in Volume 2.

Most checklists correspond to an EICAS alert message. The EICAS alert message indicates a non-normal condition, and is the cue to select and do the associated checklist.

Checklists without an EICAS alert message (such as Ditching) are called unannunciated checklists. Most unannunciated checklists are in the associated system section. For example, Fuel Leak is in section 12, Fuel. Unannunciated checklists with no associated system are in section 0, Miscellaneous.

A rectangle icon  precedes all EICAS alert messages that have procedural steps, notes, or other information of which the flight crew should be aware. The rectangle icon is removed from the EICAS alert message when the checklist has been completed. In the printed non-normal checklists, the titles also have the rectangle icon to agree with the EICAS alert message. EICAS alert messages without rectangle icons are informational, have no procedural steps or notes, or the action is obvious (such as OVERSPEED).

All checklists have condition statements. The condition statement briefly describes the situation that caused the EICAS alert message. Unannunciated checklists also have condition statements to help in understanding the reason for the checklist.

Some checklists have objective statements. The objective statement briefly describes the expected result of doing the checklist or briefly describes the reason for steps in the checklist.

Checklists can have both memory and reference items. Memory items are critical steps that must be done before reading the checklist. In the printed non-normal checklists, the last memory item is followed by a dashed horizontal line. In the electronic checklists, memory items are not identified. Reference items are actions to be done while reading the checklist.

Some checklists have considerations/additional information at the end of the checklist. The considerations/additional information provides data the crew may wish to consider. The considerations/additional information does not need to be read.

Checklists that need a quick response are listed in the Quick Action Index. In each system section, Quick Action Index checklists are listed first, followed by checklists that are not in the Quick Action Index. The titles of Quick Action Index checklists are printed in **bold** type. Checklist titles in upper case (such as AUTOBRAKE) are annunciated by an EICAS alert message. Checklist titles in upper and lower case (such as Window Damage L, R) are not annunciated.

Electronic Checklist Operation

A non-normal menu is given for the electronic checklist.

The primary purposes of the non-normal menu are to access unannunciated checklists and to access the condition statements for EICAS alert messages without rectangle icons.

The non-normal menu is also used to access checklists for EICAS alert messages with rectangle icons to allow review of the checklist. Operation of the electronic checklist is described in section 10; Flight Instruments, Displays.

Non-Normal Checklist Operation

Non-normal checklists start with steps to correct the situation. If needed, information for planning the rest of the flight is included. In the printed non-normal checklists, when special items are needed to configure the airplane for landing, the items are included in the Deferred Items section of the checklist. In the electronic checklists, deferred times are automatically added to the end of the applicable normal checklist. Flight patterns for some non-normal situations are located in the Maneuvers chapter and show the sequence of configuration changes.

While every attempt is made to supply needed non-normal checklists, it is not possible to develop checklists for all conceivable situations. In some smoke, fire, or fumes situations, the flight crew may need to move between the Smoke, Fire or Fumes checklist and the Smoke or Fumes Removal checklist. In some multiple failure situations, the flight crew may need to combine the elements of more than one checklist. In all situations, the captain must assess the situation and use good judgment to determine the safest course of action.

It should be noted that, in determining the safest course of action, in-flight troubleshooting by the flight crew may cause further loss of system function or system failure.

There are some situations where the flight crew must land at the nearest suitable airport. These situations include, but are not limited to, conditions where:

- the non-normal checklist includes the item “Plan to land at the nearest suitable airport.”
- fire or smoke continues

787 Flight Crew Operations Manual

- only two AC power sources remain (two main engine generators, or one main engine generator and both APU generators)
- any other situation determined by the flight crew to have a significant adverse effect on safety if the flight is continued

It must be stressed that for smoke that continues or a fire that cannot be positively confirmed to be completely extinguished, the earliest possible descent, landing, and evacuation must be done.

If a smoke, fire or fumes situation becomes uncontrollable, the flight crew should consider an immediate landing. Immediate landing implies immediate diversion to a runway. However, in a severe situation, the flight crew should consider an overweight landing, a tailwind landing, an off-airport landing, or a ditching.

Checklists directing an engine shutdown must be evaluated by the captain to determine whether an actual shutdown or operation at reduced thrust is the safest course of action. Consideration must be given to the probable effects of running the engine at reduced thrust.

There are no non-normal checklists for the loss of an engine indication or automatic display of the secondary engine indications. Continue normal engine operation unless an EICAS alert message shows or a limit is exceeded.

Non-normal checklists also assume:

- during engine start and before takeoff, the associated non-normal checklist is done if an EICAS alert message is shown or a non-normal situation is identified. After completion of the checklist, the Dispatch Deviations Guide or operator equivalent is consulted to determine if Minimum Equipment List dispatch relief is available
- system controls are in the normal configuration for the phase of flight before the start of the non-normal checklist
- aural alerts are silenced and the system is reset by the flight crew as soon as the cause of the alert is recognized
- the EICAS message list is cancelled after all checklists are complete or on hold so that future messages are more noticeable
- the EMERGENCY position of the oxygen regulator is used when needed to supply positive pressure in the masks and goggles to remove contaminants
 - the 100% position of the oxygen regulator is used when positive pressure is not needed, but contamination of the flight deck air exists
 - the Normal position of the oxygen regulator is used if prolonged use is needed and the situation allows
 - normal boom microphone operation is restored when oxygen is no longer in use
- indicator lights are tested to verify suspected faults

- in flight, reset of a tripped circuit breaker is not recommended
 - however, a tripped circuit breaker may be reset once, after a short cooling period (approximately 2 minutes), if in the judgment of the captain, the situation resulting from the circuit breaker trip has a significant adverse effect on safety
 - on the ground, flight crew reset of a tripped circuit breaker should only be done after maintenance has determined that it is safe to reset the circuit breaker
 - flight crew cycling (pulling and resetting) of a circuit breaker to clear a non-normal condition is not recommended, unless directed by a non-normal checklist

Non-Normal Checklist Use

If a checklist or a step in a checklist is not applicable to all airplanes, airplane effectivity information is included in the checklist. Airplane effectivity can be listed by airplane number, registry number, serial number or tabulation number. If a checklist is applicable to some but not all airplanes, airplane effectivity is centered below the checklist title. If a step in a checklist is applicable to some but not all airplanes, airplane effectivity is included above the step. If a checklist or a step in a checklist is applicable to all airplanes, airplane effectivity information is not included.

Non-normal checklist use starts when the airplane flight path and configuration are correctly established. Only a few situations need an immediate response (such as CABIN ALTITUDE). Usually, time is available to assess the situation before corrective action is started. All actions must then be coordinated under the captain's supervision and done in a deliberate, systematic manner. Flight path control must never be compromised.

When a non-normal situation occurs, at the direction of the pilot flying, both crewmembers do all memory items in their areas of responsibility without delay.

The pilot flying calls for the checklist when:

- the flight path is under control
- the airplane is not in a critical phase of flight (such as takeoff or landing)
- all memory items are complete

For checklists with memory items, the pilot monitoring first verifies that each memory item has been done. The checklist is normally read aloud during this verification. The pilot flying does not need to respond except for items that are not in agreement with the checklist. With the electronic checklist, items that are complete (green) do not need to be read or verified. The item numbers do not need to be read.

Non-memory items are called reference items. The pilot monitoring reads aloud the reference items, including:

- the precaution (if any)
- the response or action
- any amplifying information

The pilot flying does not need to repeat this information but must acknowledge that the information was heard and understood. The item numbers do not need to be read.

The word "Confirm" is added to checklist items when both crewmembers must verbally agree before action is taken. During an inflight non-normal situation, verbal confirmation is required for:

- an autothrottle arm switch
- an engine thrust lever
- a fuel control switch
- an engine or APU fire switch, or a cargo fire arm switch
- a generator drive disconnect switch

This does not apply to the Dual Eng Fail/Stall checklist.

With the airplane stationary on the ground:

- the captain and the first officer take action based on preflight and postflight areas of responsibility

With the airplane in flight or in motion on the ground:

- the pilot flying and the pilot monitoring take action based on each crewmember's Area of Responsibility

After moving the control, the crewmember taking the action also states the checklist response.

Closed loop (sensed) checklist items change from white to green when the action is taken. The pilot monitoring must "check off" any open loop (not sensed) items and verify that all closed loop items are green.

The pilot flying may also direct reference checklists to be done by memory if no hazard is created by such action, or if the situation does not allow reference to the checklist.

Checklists include an Inoperative Items table only when the condition of the items is needed for planning the rest of the flight and the condition is not shown on EICAS. The inoperative items, including the consequences (if any), are read aloud by the pilot monitoring. The pilot flying does not need to repeat this information but must acknowledge that the information was heard and understood.

Consequential EICAS alert messages can show as a result of a primary failure condition (such as AUTO SPEEDBRAKE as a result of HYD PRESS SYS C) or as a result of doing a non-normal checklist (such as PACK L or PACK R as a result of doing the Smoke, Fire or Fumes checklist). Consequential messages are shown for flight crew awareness, with the rectangle icons automatically removed. The flight crew does not do the checklists for consequential EICAS alert messages. In the printed primary checklist, the statement “Do not accomplish the following checklists:” is included to inform the flight crew of consequential checklists. In the electronic primary checklist, the statement “Inhibited checklists:” is included to inform the flight crew of consequential checklists. When doing the electronic primary checklist, the statement and the list of checklists do not need to be read. All consequential EICAS alert messages may not show while doing the primary checklist, depending on operational circumstances.

After completion of the non-normal checklist, normal procedures are used to configure the airplane for each phase of flight.

When there are no deferred items, the DESCENT, APPROACH, and LANDING normal checklists are used to verify that the configuration is correct for each phase of flight.

When there are deferred items, the non-normal checklist will include the item "Checklist Complete Except Deferred Items." The pilot flying is to be made aware when there are deferred items. In the printed non-normal checklists, these items are included in the Deferred items section of the checklist and may be delayed until the usual point during descent, approach, or landing. In the electronic checklists, these items are automatically added to the end of the applicable normal checklist and may be delayed until the usual point during descent, approach, or landing.

The deferred items are read aloud by the pilot monitoring. The pilot flying or the pilot monitoring takes action based on each crewmember's area of responsibility. After moving the control, the crewmember taking the action also states the response.

In the printed non-normal checklists, when there are deferred items, the Deferred Items section of the non-normal checklist will include the Descent, Approach, and Landing normal checklists. These checklists should be used instead of the usual DESCENT, APPROACH, and LANDING normal checklists. If a normal checklist item is changed as a result of the non-normal situation, the changed response is printed in bold type. In the electronic checklists, when there are deferred items, the items are automatically added to the end of the usual DESCENT, APPROACH, or LANDING normal checklist. The pilot flying or the pilot monitoring responds to the deferred normal checklist items based on each crewmember's area of responsibility. However, during the deferred Landing normal checklist, the pilot flying responds to all deferred normal checklist items.

In the printed non-normal checklist, each checklist has a checklist complete symbol at the end. The following symbol indicates that the checklist is complete:



The checklist complete symbol can also be in the body of the checklist. This only occurs when a checklist divides into two or more paths. Each path can have a checklist complete symbol at the end. The flight crew does not need to continue reading the checklist after a checklist complete symbol in the body of the checklist. In the electronic checklists, each checklist has a "Checklist Complete" item at the end. There is only one checklist complete item.

After completion of each non-normal checklist, the pilot monitoring states "____ CHECKLIST COMPLETE."

Considerations/additional information at the end of the checklist is not required to be read.

The flight crew must be aware that checklists cannot be created for all conceivable situations and are not intended to replace good judgment. In some situations, at the captain's discretion, deviation from a checklist may be needed.

Non-Normal Checklist Legend

Redirection Symbol



This redirection symbol is used, in a non-normal checklist, with the words "Go to," to direct the flight crew to a different checklist or to a different step in the current checklist.

Separator symbol



The separator symbol is used in two ways:

- in the Table of Contents of a system section, to separate the Quick Action Index checklists from the checklists that are not in the Quick Action Index
- in a non-normal checklist, to separate the memory items from the reference items

Task Divider Symbol

The task divider symbol is used to indicate the end of one task and the beginning of another task.

Decision Symbol



The decision symbol is used to identify possible choices.

Precaution Symbol



The precaution symbol is used to identify information the flight crew must consider before taking the action.

**Evacuation Checklist is on the
reverse side of this page.**

Evacuation

Condition: An evacuation is needed.

- 1

PARKING BRAKE.

Set

C
- 2

OUTFLOW VALVE
switches (both)

MAN

F/O
- 3

OUTFLOW VALVE MANUAL
switches (both)

Push to OPEN
and hold until the outflow
valve indications show fully open

F/O
- 4

FUEL CONTROL
switches (both)

CUTOFF

C
- 5

Advise the cabin to evacuate.

C
- 6

Advise the tower.

F/O
- 7

Engine fire switches (both)

Pull

F/O
- 8

APU fire switch

Override and pull

F/O
- 9

If an engine or APU fire warning light is
illuminated:

Illuminated fire
switch

Rotate to the stop
and hold for 1 second

F/O
- ■ ■ ■